U.S. DEPARTMENT OF COMMERCE
National Technical Information Service

PB-258 472

Report of Fuel Requirements, Capital Cost and Operating Expense for Catalytic Afterburners

C-E Air Preheater, Wellsville, N Y

Prepared for

Environmental Protection Agency, Research Triangle Park, N C Office of Air Quality Planning and Standards

Sep 76

PB258472

TECHNICAL REPORT DATA
(Please read Instructions on the reverse before completing)

1. REPORT NO.	2.	3. RECIPIENT'S ACCESSION NO.
EPA-450/3-76-031		

4. TITLE AND SUBTITLE	5. REPORT DATE
Report of Fuel Requirements, Capital Cost and Operating Expense for Catalytic and Thermal Afterburners	September 1976
	6. PERFORMING ORGANIZATION CODE
7. AUTHOR(S)	8. PERFORMING ORGANIZATION REPORT NO.
C-E Air Preheater	
9. PERFORMING ORGANIZATION NAME AND ADDRESS	10. PROGRAM ELEMENT NO.
C-E Air Preheater Wellsville, New York	11. CONTRACT/GRANT NO. EPA 68-02-1473
12. SPONSORING AGENCY NAME AND ADDRESS	13. TYPE OF REPORT AND PERIOD COVERED
Environmental Protection Agency Office of Air Quality Planning and Standards Emission Standards & Engineering Div. (MD/13) Research Triangle Park, North Carolina 27711	14. SPONSORING AGENCY CODE

15. SUPPLEMENTARY NOTES

16. ABSTRACT

The purpose of this manual is to provide capital and operating costs and fuel consumption of direct flame and catalytic incinerators for volatile organics. Three flow rates (5,000, 15,000 and 30,000 scfm), two inlet temperatures (70°F and 300°F), four concentration levels of organics (0%, 5%, 15% and 25% of the lower explosive limit) and four heat recovery options (no recovery, primary heat recovery, primary and secondary heat recovery, and direct reuse of incinerator exhaust) are evaluated. Cost estimates are detailed to enable easy updating or estimation using any set of assumptions.

PRICES SUBJECT TO CHANGE

17. KEY WORDS AND DOCUMENT ANALYSIS

a. DESCRIPTORS	b. IDENTIFIERS/OPEN ENDED TERMS	c. COSATI Field/Group
Industrial Emission Sources Costs Manual Incinerators	Cost Estimation Techniques Capital Costs Annualized Costs Air Pollution Control Systems	

18. DISTRIBUTION STATEMENT	19. SECURITY CLASS (This Report)	21. NO. OF PAGES
Unlimited	Unclassified	251
	20. SECURITY CLASS (This page)	22. PRICE
	Unclassified	$9.00 - 3.00

EPA Form 2220-1 (9-73)

288111

PB 258 472

EPA-450/3-76-031
September 1976

REPORT OF FUEL REQUIREMENTS, CAPITAL COST AND OPERATING EXPENSE FOR CATALYTIC AFTERBURNERS

REPRODUCED BY
NATIONAL TECHNICAL
INFORMATION SERVICE
U. S. DEPARTMENT OF COMMERCE
SPRINGFIELD, VA. 22161

U.S. ENVIRONMENTAL PROTECTION AGENCY
Office of Air and Waste Management
Office of Air Quality Planning and Standards
Research Triangle Park, North Carolina 27711

EPA-450/3-76-031

REPORT OF FUEL REQUIREMENTS, CAPITAL COST AND OPERATING EXPENSE FOR CATALYTIC AFTERBURNERS

by

CE Air Preheater
Industrial Gas Cleaning Institute
Stamford, Connecticut 06904

Contract No. 68-02-1473
Task No. 13

EPA Project Officer: Frank Bunyard

Prepared for

ENVIRONMENTAL PROTECTION AGENCY
Office of Air and Waste Management
Office of Air Quality Planning and Standards
Research Triangle Park, North Carolina 27711

September 1976

ia

This report is issued by the Environmental Protection Agency to report technical data of interest to a limited number of readers. Copies are available free of charge to Federal employees, current contractors and grantees, and nonprofit organizations - in limited quantities - from the Library Services Office (MD35), Research Triangle Park, North Carolina 27711; or, for a fee, from the National Technical Information Service, 5285 Port Royal Road, Springfield, Virginia 22161.

This report was furnished to the Environmental Protection Agency by CE Air Preheater, Industrial Gas Cleaning Institute, Stamford, Connecticut, in fulfillment of Contract No. 68-02-1473, Task No. 13. The contents of this report are reproduced herein as received from CE Air Preheater. The opinions, findings, and conclusions expressed are those of the author and not necessarily those of the Environmental Protection Agency. Mention of company or product names is not to be considered as an endorsement by the Environmental Protection Agency.

Publication No. EPA-450/3-76-031

CONTENTS

	Page
SUMMARY	v
CASE 1, INCINERATION WITH NO HEAT RECOVERY	1
CASE 2, INCINERATION WITH PRIMARY HEAT RECOVERY	65
CASE 3, INCINERATION WITH PRIMARY AND SECONDARY HEAT RECOVERY	129
CASE 4, INCINERATION WITH DIRECT REUSE OF EXHAUST GASES	193
APPENDIX: CAPITAL COSTS FOR AFTERBURNERS	203

SUMMARY

This report presents the results and conclusions of an investigation in accordance with the Environmental Protection Agency's Contract Number 68-02-1473.

The scope of this study is to develop fuel consumption data, capital costs and annual operating costs for direct flame and catalytic incineration of light hydrocarbon solvents. The following combinations of operating parameters were investigated:

a) Catalytic and thermal afterburners for three cases; 1) no heat recovery; 2) 35% primary heat recovery; and 3) 35% primary heat recovery and 55% secondary heat recovery.

b) Inlet flow rates to the afterburners of 5,000, 15,000, and 30,000 scfm.

c) Inlet stream temperature of 70°F and 300°F for all three cases.

d) Inlet stream LEL's of 0%, 5%, 15% and 25%.

e) A Case 4 situation is investigated in which a thermal afterburner with 35% primary heat recovery is used in conjunction with an oven that uses a portion of the incinerated gases to supply oven heat.

The following assumptions were utilized in developing costs:

a) Afterburners designed for oil operation only (gas only for Case 4).

b) Thermal afterburners capable of 1500°F operation with a 0.5 second residence time.

c) Catalytic afterburners capable of 800°F operation below 6% LEL; 1200°F design capability for operation from 6% to 25% LEL.

d) Three-year catalyst life before replacement is necessary - replacement cost annualized with a 7.5% inflation factor and added to yearly fuel cost.

e) Costs based on outdoor location.

f) Rooftop installation requiring structural steel.

Preceding page blank

g) Installation costs developed for weight and complexity of unit, rather than a fixed percentage of capital investment for equipment.

h) Fuel cost of 1.50 $/MM Btu (gross).

i) Electricity at .03 $/KWH.

j) Yearly maintenance 4% of capital investment.

k) Yearly tax 1% of capital investment.

l) Yearly insurance 0.5% of capital investment.

m) Yearly building overhead 2.5% of capital investment.

n) Yearly depreciation 12% of capital investment.

o) Yearly interest 5% of capital investment.

p) Annualized expenditure 25% of capital investment (summation items j thru o).

q) Direct labor assessed at .5 hrs/shift x 730 shifts/year x 8.00 $/hr. = 2920 $/year direct labor expense.

r) Operation time: 2 shifts/day x 9 hrs/shift x 365 days/year = 5840 hrs/year.

The direct flame incinerator (thermal afterburner) utilized was based on standard designs for oil firing incorporating the following features:

a) 0.5 seconds residence time.

b) Nozzle mix burner capable of #2 thru #6 oil firing.

c) Forced mixing of the burner products of combustion using a slotted cylinder mixing arrangement. This cylinder allows the burner flame to establish itself before radial entry of the effluent thru slots in the far end of the cylinder.

d) A portion of the effluent to be incinerated is ducted to the burner to serve as combustion air - this allows the burner to act as a raw gas burner - thus, saving fuel over conventional nozzle mix burners - can only be used however when the O_2 content of the oven exhaust is 17% b.v. or above.

e) The incinerator for Case 4 uses a line burner, such as the Maxon Combustifume, which is a gas fired secondary air (raw gas) burner. Minimum 0.3 second retention time at 1500°F operation.

The catalytic afterburner was costed for two design points, 800°F and 1200°F. The higher temperature design is required for LEL levels exceeding 6% (at 600°F into the catalyst and a 6% LEL, the outlet temperature of the catalyst is approximately 800°F - at a 25% LEL condition and a minimum initiation temperature of 500°F, the catalyst reaches an outlet temperature of around 1200°F.)

The catalyst unit requires a burner to preheat the oven effluent to a minimum initiation temperature of 500°F, with 600°F required for some of the slower oxidizing hydrocarbons (generally, the acetate family and the C-1, and C-2 hydrocarbons). The catalyst element will operate successfully in an oil fired environment, however, only the clean oils (Nos. 1 and 2) can be employed as the heavier oils contain metallics which will shorten the life of the catalyst.

A catalytic element is poisoned (deactivated) by heavy metals such as mercury, lead and arsenic. However, if these elements are in heavy enough concentrations to severely shorten the catalyst life, then the elements themselves would represent an environmental hazard when discharged to the atmosphere.

The catalytic element may be blinded by any particulate matter in the exhaust to be incinerated. This blinding reduces effectiveness since the catalyst contact area has been decreased. Effectiveness can be nearly fully restored by cleaning via air lancing or possibly washing in a detergent solution.

Temperature wise the catalyst can operate at approximately 1200°F and still give normal (2-3 years) service life. However, sustained operation at temperatures higher than 1200°F can severely shorten life. In general, catalyst manufacturers will limit their applications to streams with concentrations no higher than 25% LEL.

Case 1

The Case 1 system is a straight afterburner concept using no heat recovery.

An analysis of our generated cost, fuel rates, and expenses shows that the catalytic unit is attractive for use in low LEL exhausts with the direct flame afterburners a better proposition for the higher LEL concentrations. One thing that must be remembered in comparing fuel rates between the two principles is that for the same efficiency the direct flame unit will operate at temperatures lower than the 1400°F used for an incineration temperature in the study. Assuming 90% reduction on a straight hydrocarbon destruction basis, the direct flame unit would operate at 1200°F. If CO concentrations are taken into account (such as LA Rule 66), the incineration temperature would be in the 1360°F region.

Case 2

The Case 2 system uses a straight afterburner section with either a catalyst or direct flame incineration, and incorporates a shell and tube heat exchanger of 35% nominal efficiency to preheat the effluent before introduction to the oxidation section.

This size heat exchanger, which is about the smallest efficiency practical on a commercial basis, reduces the fuel rate significantly at all inlet temperatures and LEL conditions. However, at the higher LEL condition, it presents problems for the catalytic unit in terms of burner turndown, operation within the 1200°F high temperature limit, etc.

As shown, at 21-25% LEL conditions and 70°F inlet process gas temperature the catalytic unit must use a lower initiation temperature in order to keep the catalytic outlet temperature at a 1200°F level. And when the inlet temperature is raised to 300°F, the unit can only handle an LEL of approximately 16% and still maintain a minimum burner condition and not go over a 1200°F catalyst outlet temperature.

The direct flame unit has the same problem, only at a higher LEL rate. The problem may be solved by using a bypass around the primary heat exchanger, in effect creating a heat recovery unit of variable efficiency. This is done in this study for the 300°F inlet condition and an LEL of 20 to 25%.

Case 3

The Case 3 system consists of a Case 2 unit with the addition of a secondary heat exchanger to indirectly recover incinerator heat for use in the process. The secondary heat exchanger is a two-pass shell and tube design with a nominal efficiency of 55%.

Fuel rates for the incinerators remain the same as before for Case 2. Secondary heat recovery represents various levels which correspond to the LEL concentration for catalytic units - whereas the direct flame incinerator has a constant secondary recovery. It is interesting to note that with the catalytic unit the fuel rate remains the same and secondary recovery increases with LEL concentration - as compared to the direct flame unit where secondary recovery remains the same and the fuel rate decreases as the LEL increases.

As in Case 2, the direct flame units are costed with a heat exchanger by-pass for operating conditions of 300°F and 20-25% LEL.

CASE 4

The Case 4 system is based on an oven design developed by Wagner Litho Machinery Division, National Standard Company, Secaucus, New Jersey. This oven uses the exhaust gases of a fume incinerator to supply heat. Approximately 80% of the incinerated exhaust is used, half to the baking zones and half to preheat the conveying racks (wickets) before they receive the coated sheet to be transported through the oven.

The recirculation of incinerated gases causes the O_2 level to decrease to around 17% b.v. This figure tends to decrease the flamability of the solvent air mixture yet provide adequate oxygen for stable flame propagation at the raw gas burner as well as an over sufficiency of O_2 for complete oxidation of the solvents.

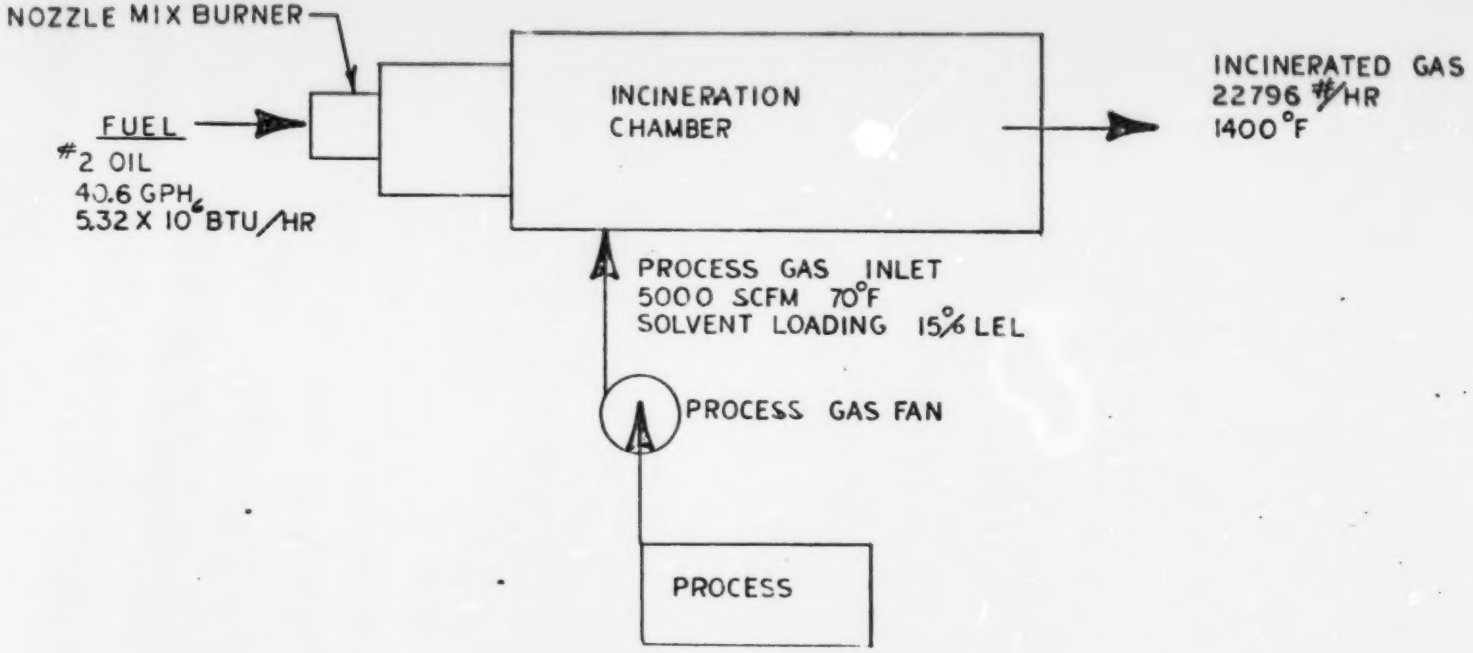
The heat recovery oven system using the recirculated exhaust gases of the incinerator will require less fuel overall than the same oven without recirculation when the LEL of the oven exhaust is in the 5 to 10 percent range. This is important if natural gas is in limited supply.

Another consideration is that the addition of the incinerator can be of economic benefit dependent upon the hours of operation, the size of the system, and the price of the fuel.

The concept of recirculating incinerator exhaust back to the process would work equally as well for catalytic incinerators. The temperature of the recirculated gases should be in the 800-1000°F temperature range, consequently a primary heat exchanger would probably not be required.

The recirculation concept is applicable to all ovens which use large quantities of hot gases to perform the drying operation. It is most economical and effective when the incinerator is an integral part of the oven.

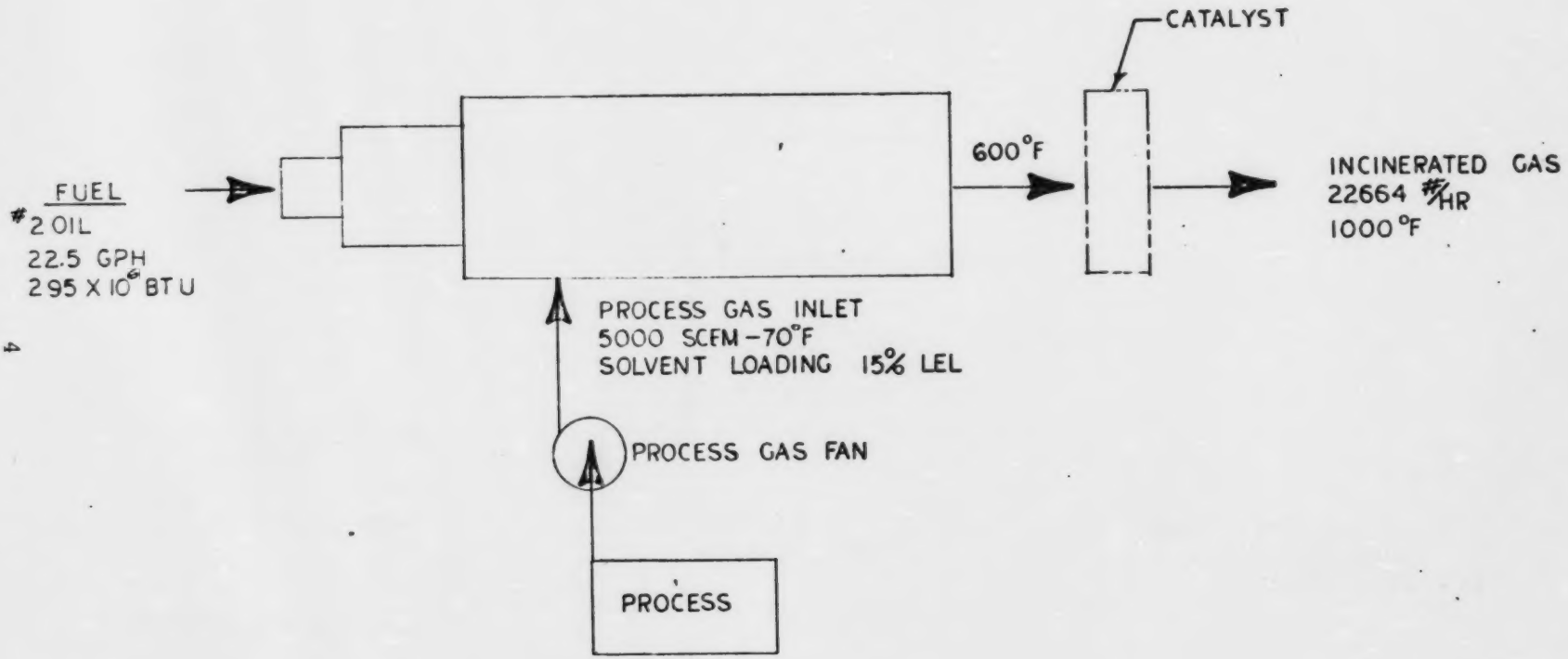
CASE 1, INCINERATION WITH NO HEAT RECOVERY



TYPICAL CASE 1

(NO HEAT RECOVERY AND NO CATALYST)

Preceding page blank



TYPICAL CASE I

(NO HEAT RECOVERY WITH CATALYST)

CASE I
NO HEAT EXCHANGER
NO CATALYST
70°F INLET TEMPERATURE

PROCESS GAS FLOW IN ACFM	PROCESS GAS FLOW IN #/HR.	INCINERATED GAS FLOW #/HR.	INLET TEMPERATURE °F	OUTLET TEMPERATURE °F	LEL %	HEAT RELEASE BTU/CF (NET)	HEAT RELEASE 10^6 BTU/HR.	BURNER REQUIREMENTS 10^6 BTU/HR. (NET)	BURNER REQUIREMENTS 10^6 BTU/HR. (GROSS)
5,000	22,500	22,945	70	1,400	0	0	0	8.00	8.50
5,000	22,500	22,895	70	1,400	5	2.83	0.85	7.10	7.56
5,000	22,500	22,796	70	1,400	15	8.47	2.54	5.32	5.66
5,000	22,500	22,698	70	1,400	25	14.11	4.23	3.56	3.79
15,000	67,500	68,835	70	1,400	0	0	0	24.00	25.50
15,000	67,500	68,685	70	1,400	5	2.83	2.54	21.31	22.67
15,000	67,500	68,389	70	1,400	15	8.47	7.62	15.98	17.00
15,000	67,500	68,093	70	1,400	25	14.11	12.71	10.66	11.34
30,000	135,000	137,670	70	1,400	0	0	0	48.00	51.00
30,000	135,000	137,371	70	1,400	5	2.83	5.08	42.63	45.36
30,000	135,000	136,780	70	1,400	15	8.47	15.23	32.00	34.05
30,000	135,000	136,187	70	1,400	25	14.11	25.40	21.34	22.71

CASE I
NO HEAT EXCHANGER
NO CATALYST
300°F INLET TEMPERATURE

PROCESS GAS FLOW IN SCFM	PROCESS GAS FLOW IN ACFM	PROCESS GAS FLOW IN #/HR.	INCINERATED GAS FLOW #/HR.	INLET TEMPERATURE °F	OUTLET TEMPERATURE °F	LEL %	HEAT RELEASE BTU/CF (NET)	HEAT RELEASE 10^6 BTU/HR.	BURNER REQUIREMENTS 10^6 BTU/HR. (NET)	BURNER REQUIREMENTS 10^6 BTU/H (GROSS)
5,000	7,170	22,500	22,875	300	1,400	0	0	0	6.71	7.13
5,000	7,170	22,500	22,824	300	1,400	5	2.83	0.85	5.82	6.20
5,000	7,170	22,500	22,725	300	1,400	15	8.47	2.54	4.05	4.30
5,000	7,170	22,500	22,627	300	1,400	25	14.11	4.23	2.28	2.43
15,000	21,509	67,500	68,120	300	1,400	0	0	0	20.13	21.43
15,000	21,509	67,500	68,472	300	1,400	5	2.83	2.54	17.48	18.59
15,000	21,509	67,500	68,176	300	1,400	15	8.47	7.62	12.16	12.93
15,000	21,509	67,500	67,880	300	1,400	25	14.11	12.71	6.83	7.27
30,000	43,019	135,000	137,240	300	1,400	0	0	0	40.27	42.85
30,000	43,019	135,000	136,944	300	1,400	5	2.83	5.08	34.95	37.19
30,000	43,019	135,000	136,352	300	1,400	15	8.47	15.23	24.31	25.86
30,000	43,019	135,000	137,670	300	1,400	25	14.11	25.40	13.66	14.54

CASE 1
NO HEAT EXCHANGER
WITH CATALYST
70°F INLET TEMPERATURE

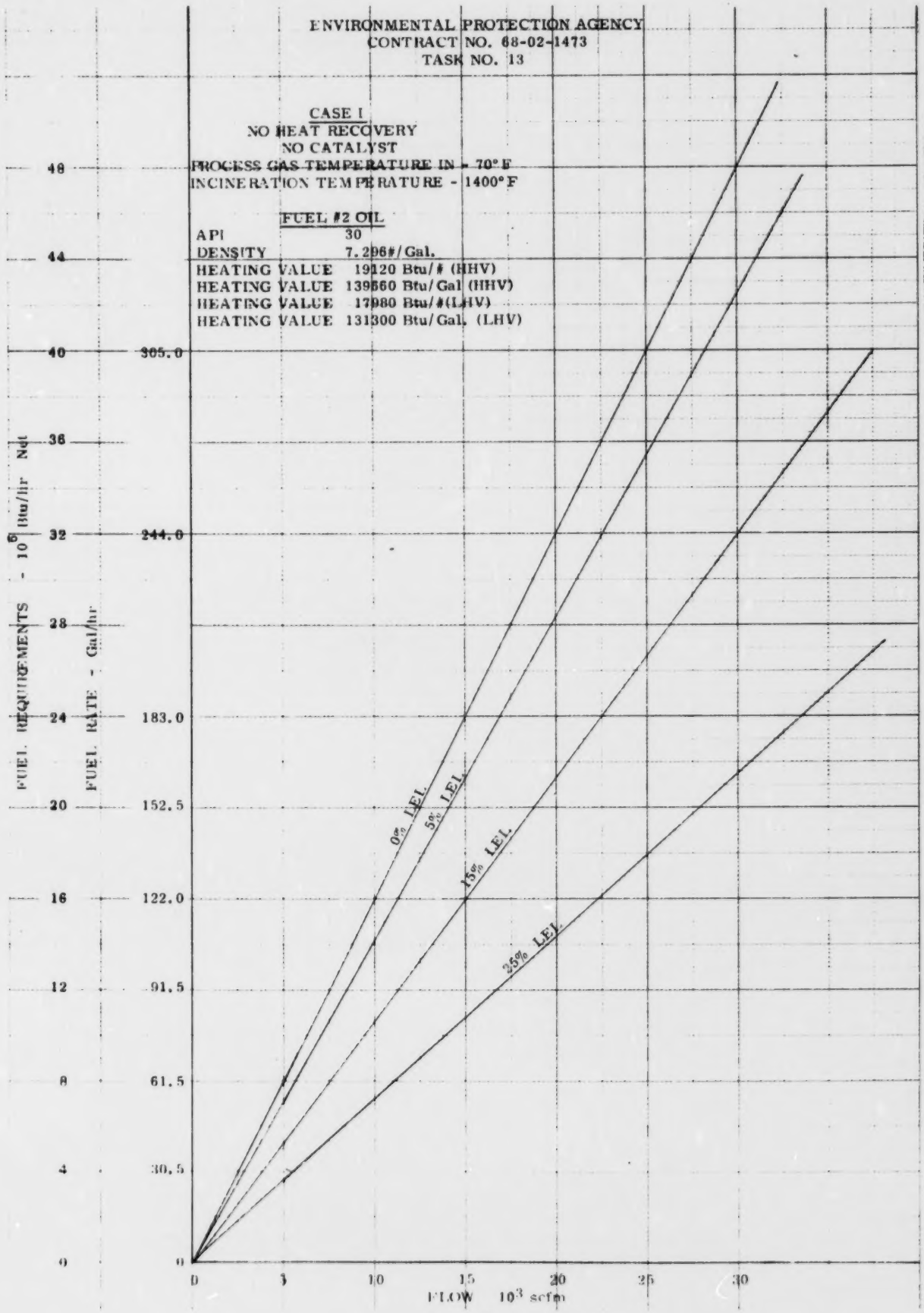
PROCESS GAS FLOW IN SCFM	PROCESS GAS FLOW IN ACFM	PROCESS GAS FLOW IN #/HR.	GAS FLOW THRU CATALYST #/HR.	PROCESS GAS IN TEMPERATURE IN °F	GAS TEMPERATURE INTO CATALYST °F	GAS TEMPERATURE LEAVE CATALYST °F	LEL %	*HEAT RELEASE FROM CATALYST 10^6 BTU/HR.	BURNER REQUIREMENTS 10^6 BTU/HR. (NET)	10^6 BTU/HR. (GROSS)
5,000	5,000	22,500	22,664	70	600	600	0	0	2.95	3.14
5,000	5,000	22,500	22,664	70	600	740	5	0.815	2.95	3.14
5,000	5,000	22,500	22,664	70	600	1,000	15	2.34	2.95	3.14
5,000	5,000	22,500	22,632	70	500	1,208	25	4.06	2.53	2.53
15,000	15,000	67,500	67,992	70	600	600	0	0	8.85	9.41
15,000	15,000	67,500	67,992	70	600	740	5	2.44	8.85	9.41
15,000	15,000	67,500	67,992	70	600	1,000	15	7.31	8.85	9.41
15,000	15,000	67,500	67,896	70	500	1,208	25	12.20	7.12	7.56
30,000	30,000	135,000	136,984	70	600	600	0	0	17.69	18.82
30,000	30,000	135,000	136,984	70	600	740	5	4.88	17.69	18.82
30,000	30,000	135,000	136,984	70	600	1,000	15	14.62	17.69	18.82
30,000	30,000	135,000	136,792	70	500	1,208	25	24.39	14.24	15.15

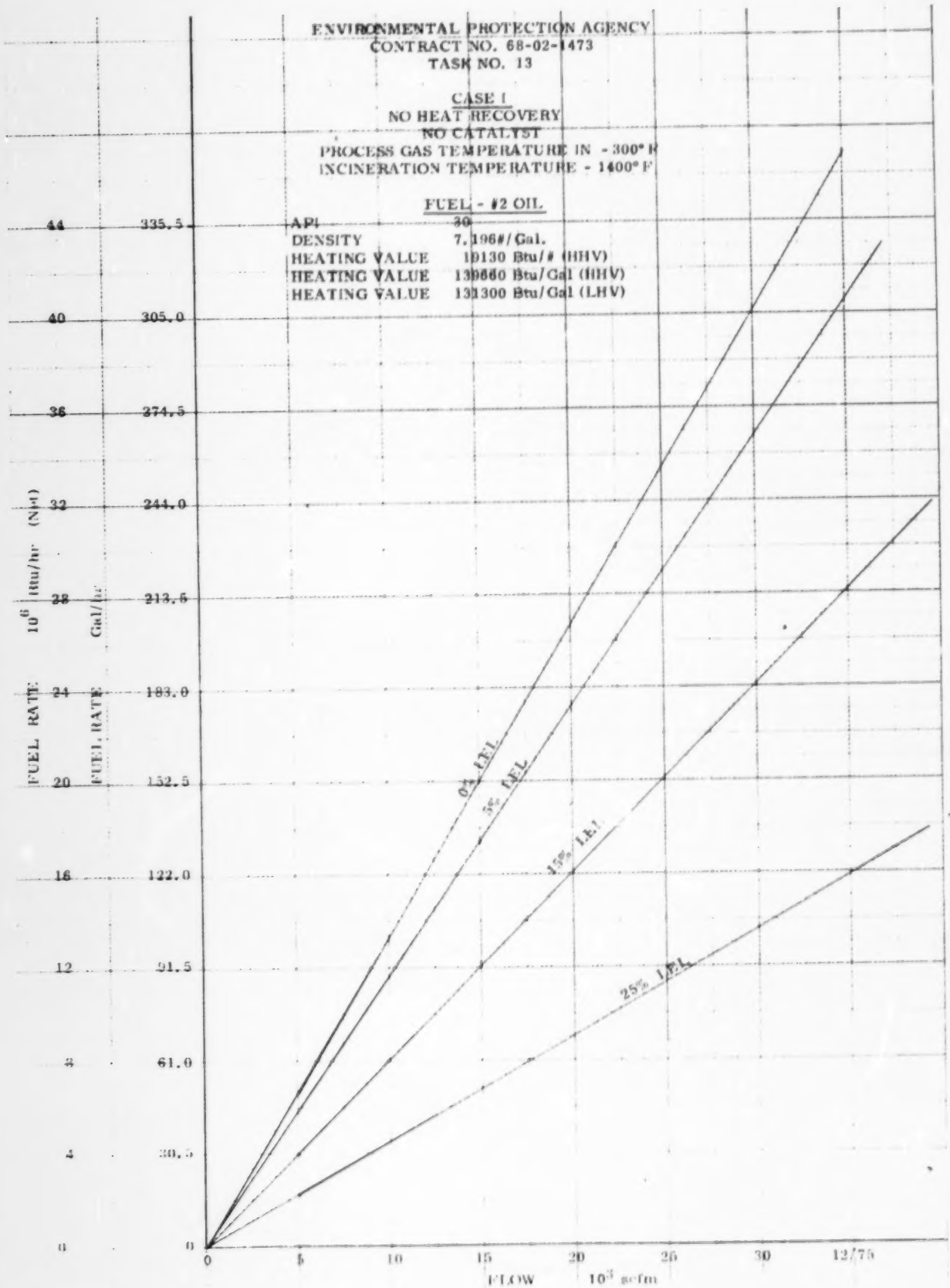
*Heat release based on 96% conversion of solvents by catalyst.

CASE 1
NO HEAT EXCHANGER
WITH CATALYST
300°F INLET TEMPERATURE

PROCESS GAS FLOW IN SCFM	PROCESS GAS FLOW IN ACFM	PROCESS GAS FLOW IN #/HR.	GAS FLOW THRU CATALYST #/HR.	PROCESS GAS IN TEMPERATURE IN °F	GAS TEMPERATURE INTO CATALYST °F	GAS TEMPERATURE LEAVE CATALYST °F	LEL %	*HEAT RELEASE FROM CATALYST 10^6 BTU/HR.	BURNER REQUIREMENTS 10^6 BTU/HR. (NET)	BURNER REQUIREMENTS 10^6 BTU/HR. (GROSS)
5,000	7,170	22,500	22,594	300	600	600	0	0	1.69	1.80
5,000	7,170	22,500	22,594	300	600	740	5	0.815	1.69	1.80
5,000	7,170	22,500	22,594	300	600	1,000	15	2.34	1.69	1.80
5,000	7,170	22,500	22,562	300	500	1,208	25	4.06	1.12	1.19
15,000	21,509	67,500	67,982	300	600	600	0	0	5.07	5.39
15,000	21,509	67,500	67,982	300	600	740	5	2.44	5.07	5.39
15,000	21,509	67,500	67,982	300	600	1,000	15	7.31	5.07	5.39
15,000	21,509	67,500	67,686	300	500	1,208	25	12.20	3.35	3.56
30,000	43,019	135,000	135,564	300	600	600	0	0	10.14	10.79
30,000	43,019	135,000	135,564	300	600	740	5	4.88	10.14	10.79
30,000	43,019	135,000	135,564	300	600	1,000	15	14.62	10.14	10.79
30,000	43,019	135,000	135,372	300	500	1,208	25	14.24	6.69	7.12

*Heat release based on 96% conversion of solvent by catalyst.


ENVIRONMENTAL PROTECTION AGENCY
CONTRACT NO. 68-02-1473
TASK NO. 13
CASE I
NO HEAT RECOVERY
NO CATALYST
PROCESS GAS TEMPERATURE IN - 70° F
INCINERATION TEMPERATURE - 1400° F
FUEL #2 OIL
API 30
DENSITY 7.296#/Gal.
HEATING VALUE 19120 Btu/# (HHV)
HEATING VALUE 139560 Btu/Gal (HHV)
HEATING VALUE 17980 Btu/#(LHV)
HEATING VALUE 131300 Btu/Gal. (LHV)
FUEL REQUIREMENTS - 10^6 Btu/hr Net
FUEL RATE - Gal/hr
48
44
40
36
32
28
24
20
16
12
8
4
0
305.0
244.0
183.0
152.5
122.0
91.5
61.5
30.5
0
0% LEL
5% LEL
15% LEL
25% LEL
0
5
10
15
20
25
30
FLOW 10^3 scfm

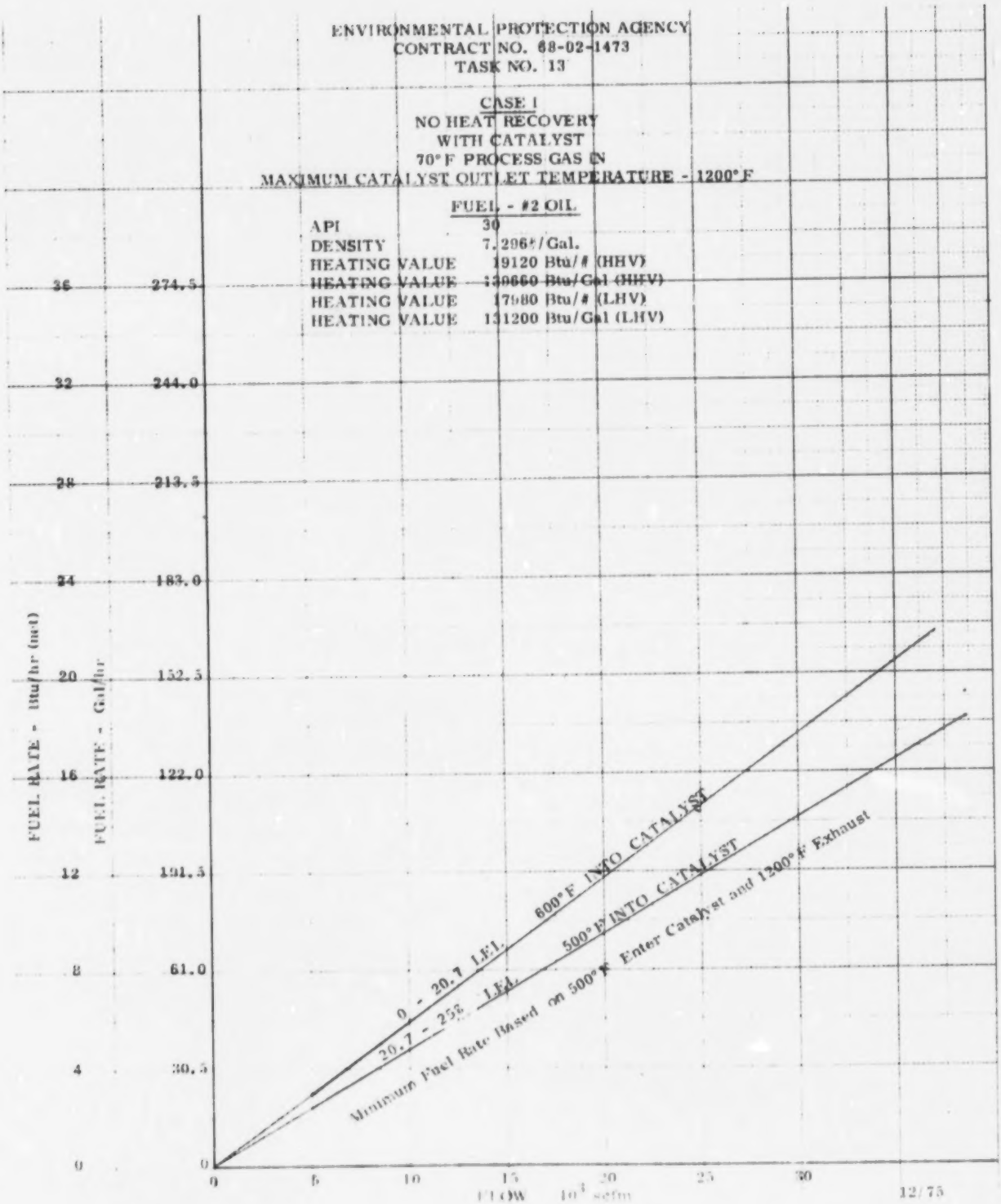

ENVIRONMENTAL PROTECTION AGENCY
CONTRACT NO. 68-02-1473
TASK NO. 13
CASE I
NO HEAT RECOVERY
NO CATALYST
PROCESS GAS TEMPERATURE IN - 300° F
INCINERATION TEMPERATURE - 1400° F
FUEL - #2 OIL
API 30
DENSITY 7.196#/Gal.
HEATING VALUE 19130 Btu/# (HHV)
HEATING VALUE 139660 Btu/Gal (HHV)
HEATING VALUE 131300 Btu/Gal (LHV)
FUEL RATE 10^6 Btu/hr (NHV)
FUEL RATE Gal/hr
44 335.5
40 305.0
36 274.5
32 244.0
28 213.5
24 183.0
20 152.5
16 122.0
12 91.5
8 61.0
4 30.5
0 0
0% LEL
5% LEL
15% LEL
25% LEL
0 5 10 15 20 25 30 12/75
FLOW 10^3 scfm

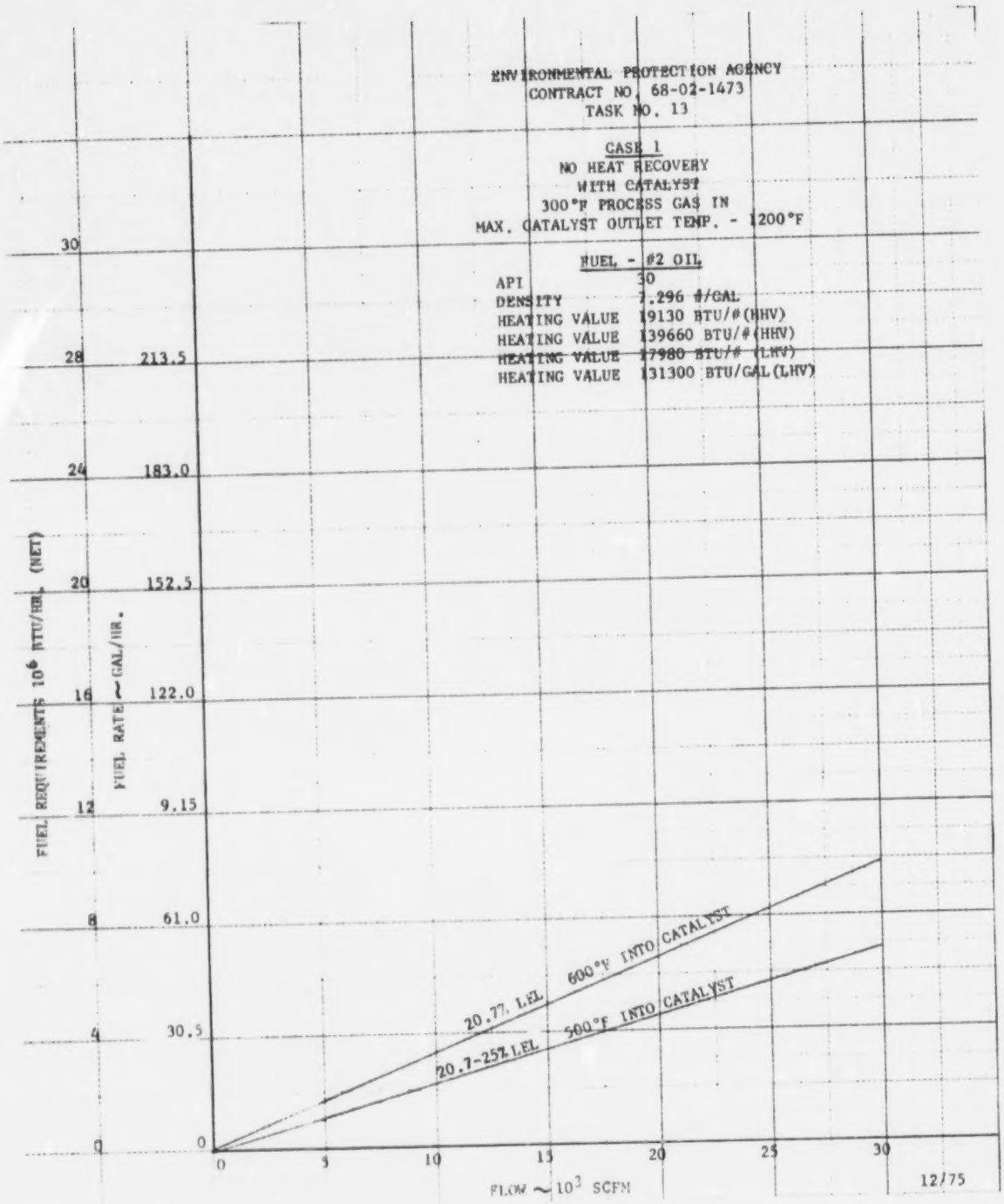
ENVIRONMENTAL PROTECTION AGENCY
CONTRACT NO. 68-02-1473
TASK NO. 13

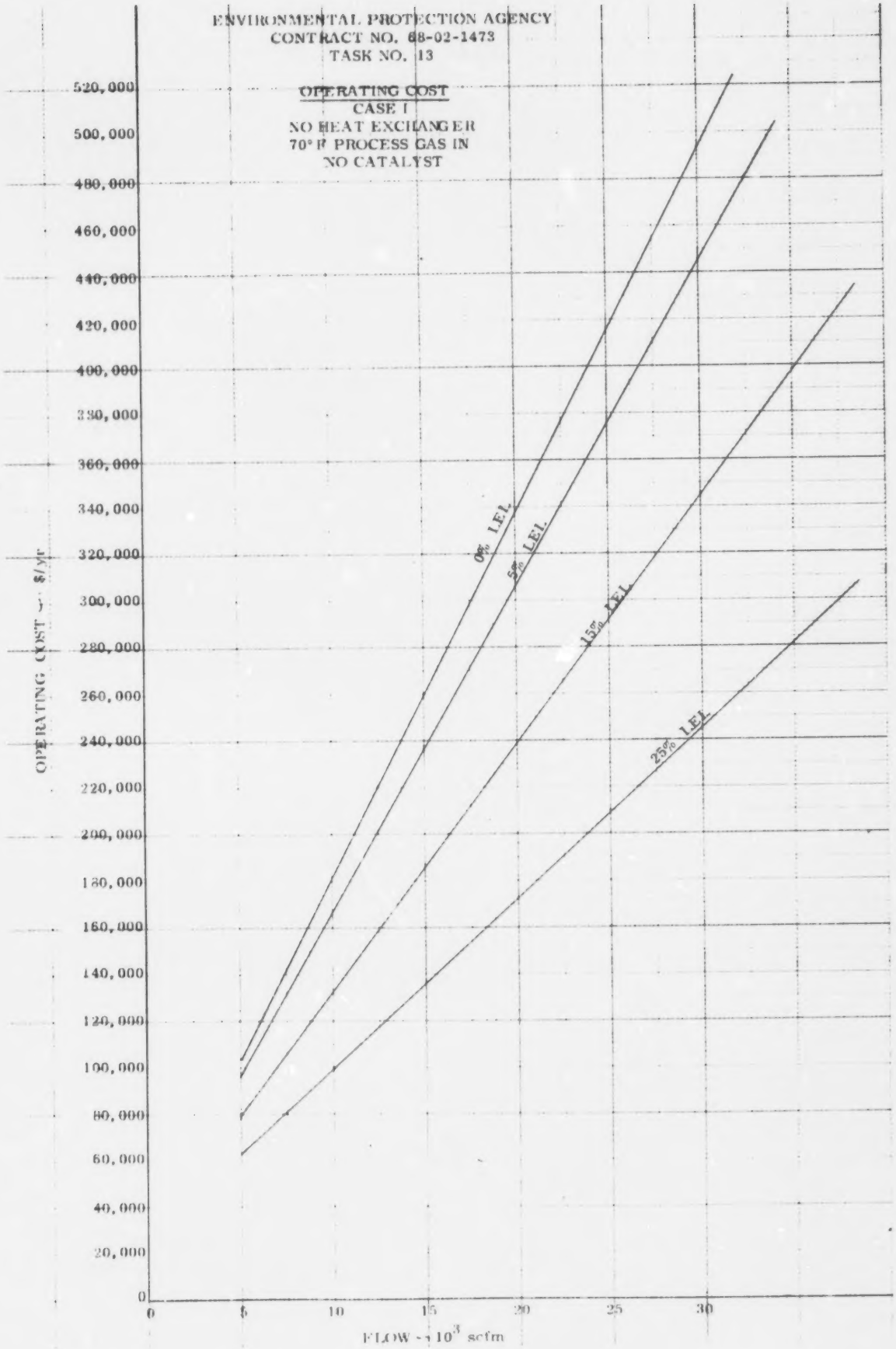
CASE I
NO HEAT RECOVERY
WITH CATALYST
70° F PROCESS GAS IN
MAXIMUM CATALYST OUTLET TEMPERATURE - 1200° F

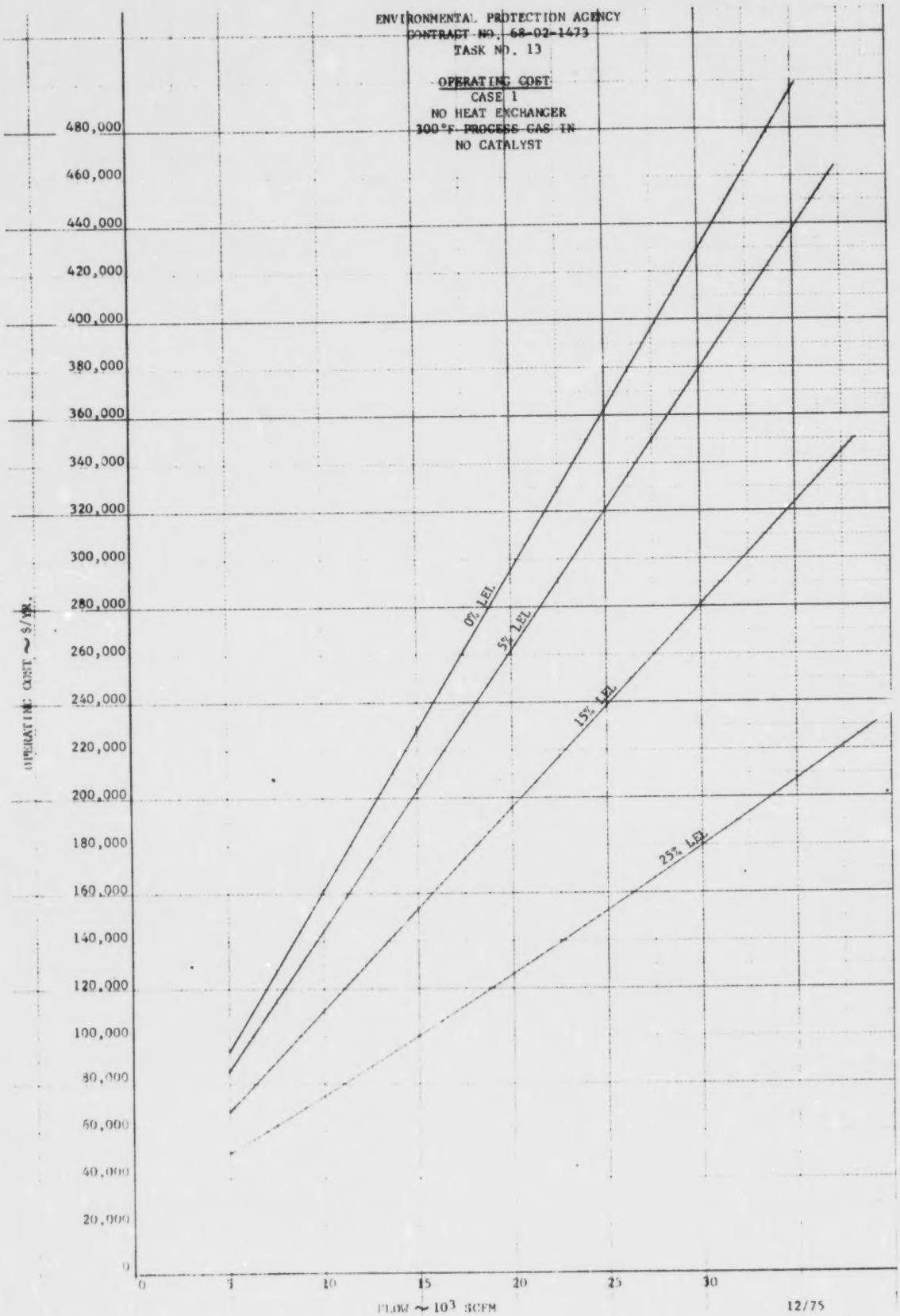
FUEL - #2 OIL

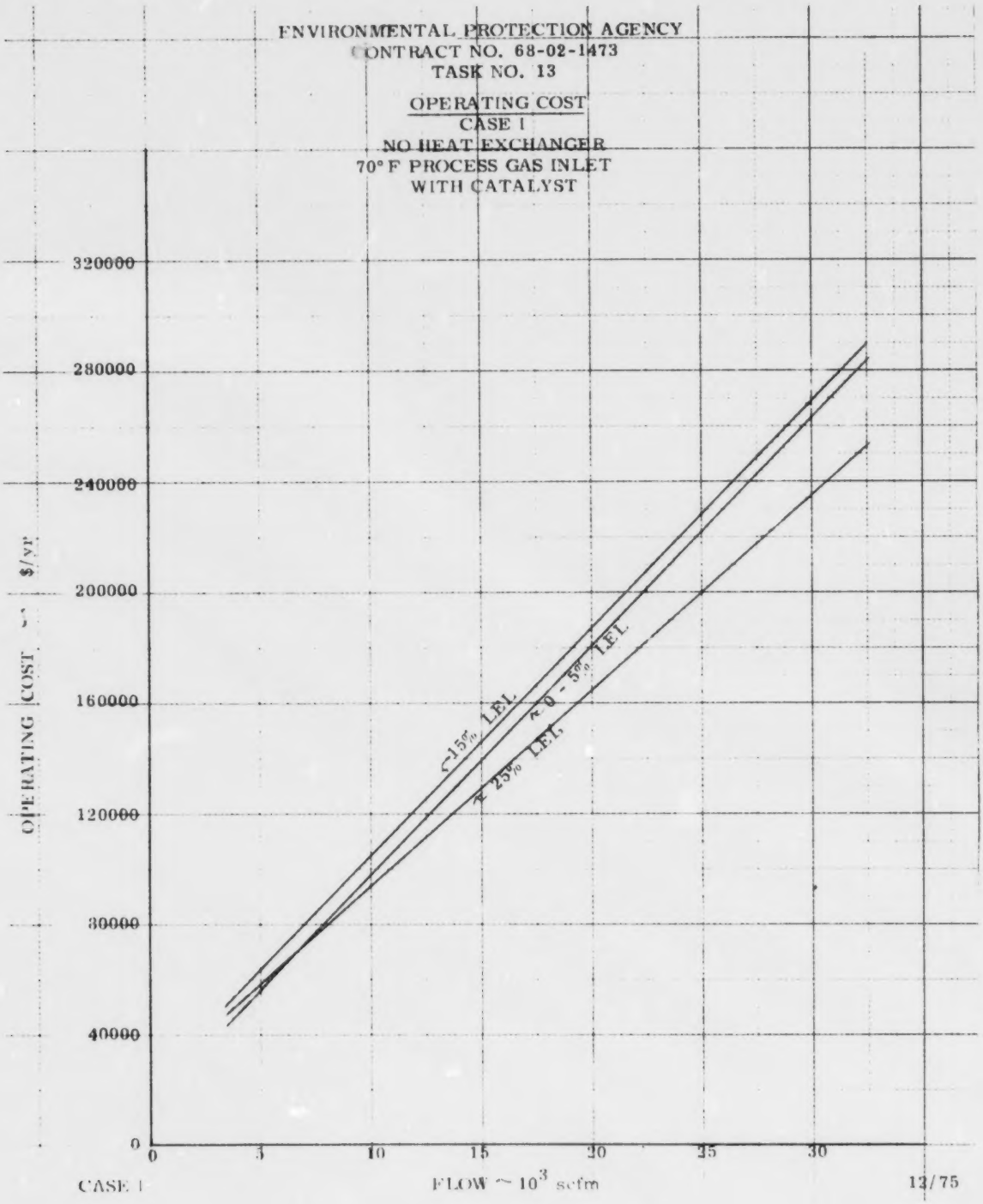
API	30
DENSITY	7.296#/Gal.
HEATING VALUE	19120 Btu/# (HHV)
HEATING VALUE	139660 Btu/Gal (HHV)
HEATING VALUE	17980 Btu/# (LHV)
HEATING VALUE	131200 Btu/Gal (LHV)

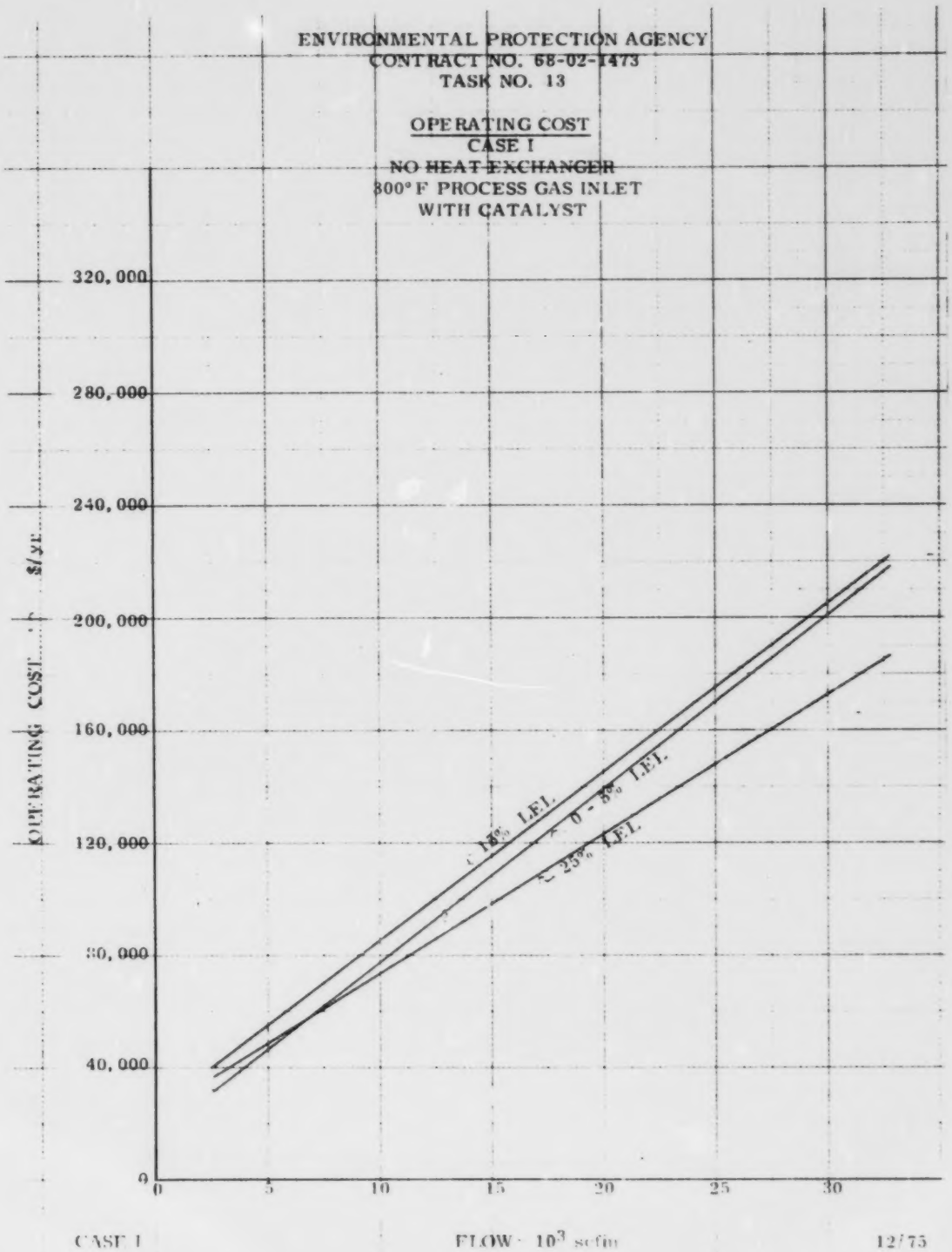



ENVIRONMENTAL PROTECTION AGENCY
CONTRACT NO. 68-02-1473
TASK NO. 13
CASE 1
NO HEAT RECOVERY
WITH CATALYST
300°F PROCESS GAS IN
MAX. CATALYST OUTLET TEMP. - 1200°F
FUEL - #2 OIL
API 30
DENSITY 7.296 #/GAL
HEATING VALUE 19130 BTU/#(HHV)
HEATING VALUE 139660 BTU/#(HHV)
HEATING VALUE 17980 BTU/# (LHV)
HEATING VALUE 131300 BTU/GAL(LHV)
FUEL REQUIREMENTS 10^6 BTU/HR. (NET)
FUEL RATE ~ GAL/HR.
30
28 213.5
24 183.0
20 152.5
16 122.0
12 9.15
8 61.0
4 30.5
0 0
0 5 10 15 20 25 30
FLOW ~ 10^3 SCFM
20.77 LEL 600°F INTO CATALYST
20.7-25% LEL 500°F INTO CATALYST
12/75


ENVIRONMENTAL PROTECTION AGENCY
CONTRACT NO. 68-02-1473
TASK NO. 13
OPERATING COST
CASE I
NO HEAT EXCHANGER
70° F PROCESS GAS IN
NO CATALYST
OPERATING COST - $/yr
520,000
500,000
480,000
460,000
440,000
420,000
400,000
380,000
360,000
340,000
320,000
300,000
280,000
260,000
240,000
220,000
200,000
180,000
160,000
140,000
120,000
100,000
80,000
60,000
40,000
20,000
0
0% LEL
5% LEL
15% LEL
25% LEL
0
5
10
15
20
25
30
FLOW - x 10^3 scfm


ENVIRONMENTAL PROTECTION AGENCY
CONTRACT NO. 68-02-1473
TASK NO. 13
OPERATING COST
CASE 1
NO HEAT EXCHANGER
300°F PROCESS GAS IN
NO CATALYST
OPERATING COST ~ $/YR.
480,000
460,000
440,000
420,000
400,000
380,000
360,000
340,000
320,000
300,000
280,000
260,000
240,000
220,000
200,000
180,000
160,000
140,000
120,000
100,000
80,000
60,000
40,000
20,000
0
0% LEL
5% LEL
15% LEL
25% LEL
0
5
10
15
20
25
30
FLOW ~ 10³ SCFM
12/75


ENVIRONMENTAL PROTECTION AGENCY
CONTRACT NO. 68-02-1473
TASK NO. 13
OPERATING COST
CASE 1
NO HEAT EXCHANGER
70° F PROCESS GAS INLET
WITH CATALYST
OPERATING COST ~ $/yr
320000
280000
240000
200000
160000
120000
80000
40000
0
0
5
10
15
20
25
30
≤15% LEL
≈ 0 - 5% LEL
≥ 25% LEL
CASE 1
FLOW ~ 10^3 scfm
12/75


ENVIRONMENTAL PROTECTION AGENCY
CONTRACT NO. 68-02-1473
TASK NO. 13
OPERATING COST
CASE I
NO HEAT EXCHANGER
800° F PROCESS GAS INLET
WITH CATALYST
320,000
280,000
240,000
200,000
160,000
120,000
80,000
40,000
0
OPERATING COST - $/yr
0
5
10
15
20
25
30
10% LEL
0 - 5% LEL
25% LEL
CASE I
FLOW - 10³ scfm
12/75

Operating Cost Estimate

Unit Size 5,000 SCFM 0 % LEL Process Temp. 70°F

Control Equipment Description

Thermal Incinerator - Case I Fume Incinerator

No Heat Recovery - No Catalyst

Process Operating Time - 2 shifts/day - 365 days/yr = 5,840 hrs

Item	Description	Cost ($/yr)	
Utilities:			
Water,			
Steam,			
#2 Fuel Oil,	$1.50/10⁶ BTU x 8.5 x 10⁶/hr x 5840 hrs	74,460	—
Electricity,	$.03/KWH x 5840 hrs x .746 KW/HP x 8.1 HP.	1,110	—
Direct Labor:	.5 hrs/shift x 730 shifts/yr x 8.00/hr	2920	—
Supplies:			
Maintenance	Use 25% of Capital Costs		
Building Overhead			
Taxes & Insurance	.25 x $ 101,775	25,445	—
Interest & Depreciation			
	Total Operating Cost	103,935	—

Operating Cost Estimate

Unit Size 5000 SCFM .5 % LEL Process Temp. 70°F

Control Equipment Description

Thermal Incinerator - Case I Fume Incinerator

No Heat Recovery - No Catalyst

Process Operating Time - 2 shifts/day - 365 days/yr = 5,840 hrs

Item	Description	Cost ($/yr)	
Utilities:			
Water,			
Steam,			
#2 Fuel Oil,	$1.50/$10^6$ BTU x 7.6 x 10^6/hr x 5840 hrs	66,576	—
Electricity,	$.03/KWH x 5840 hrs x .746 KW/HP x 8.1 HP.	1,110	—
Direct Labor:	.5 hrs/shift x 730 shifts/yr x 8.00/hr	2920	—
Supplies:			
Maintenance Building Overhead Taxes & Insurance Interest & Depreciation	Use 25% of Capital Costs .25 x $ 101,775	25,445	—
	Total Operating Cost	96,051	—

Operating Cost Estimate

Unit Size 5000 SCFM 15% LEL Process Temp. 70°F

Control Equipment Description

Thermal Incinerator - Case I Fume Incinerator

No Heat Recovery - No Catalyst

Process Operating Time - 2 shifts/day - 365 days/yr = 5,840 hrs

Item	Description	Cost ($/yr)	
Utilities:			
Water,			
Steam,			
#2 Fuel Oil,	$1.50/10⁶ BTU x 5.7 x 10⁶/hr x 5840 hrs	49,932	—
Electricity,	$.03/KWH x 5840 hrs x .746 KW/HP x 8.1 HP.	1,110	—
Direct Labor:	.5 hrs/shift x 730 shifts/yr x 8.00/hr	2920	—
Supplies:			
Maintenance	Use 25% of capital costs		
Building Overhead			
Taxes & Insurance	.25 x $ 101,775	25,445	—
Interest & Depreciation			
	Total Operating Cost	79,407	—

Operating Cost Estimate

Unit Size 5000 SCFM 25 % LEL Process Temp. 70°F

Control Equipment Description

Thermal Incinerator - Case I Fume Incinerator

No Heat Recovery - No Catalyst

Process Operating Time - 2 shifts/day - 365 days/yr = 5,840 hrs

Item	Description	Cost ($/yr)	
Utilities:			
Water,			
Steam,			
#2 Fuel Oil,	$1.50/10⁶ BTU x 3.8 x 10⁶/hr x 5840 hrs	33,288	—
Electricity,	$.03/KWH x 5840 hrs x .746 KW/HP x 8.1 HP.	1,110	—
Direct Labor:	.5 hrs/shift x 730 shifts/yr x 8.00/hr	2920	—
Supplies:			
Maintenance	Use 25% of capital costs		
Building Overhead			
Taxes & Insurance	.25 x $ 101,775	25,445	—
Interest & Depreciation			
	Total Operating Cost	62,763	—

Operating Cost Estimate

Unit Size 15,000 SCFM 0 % LEL Process Temp. 70°

Control Equipment Description

Thermal Incinerator - Case I Fume Incinerator

No Heat Recovery - No Catalyst

Process Operating Time - 2 shifts/day - 365 days/yr = 5,840 hrs

Item	Description	Cost ($/yr)	
Utilities:			
Water,			
Steam,			
#2 Fuel Oil,	$1.50/10⁶ BTU x 25.5 x 10⁶/hr x 5840 hrs	223,400	—
Electricity,	$.03/KWH x 5840 hrs x .746 KW/HP x 24.3 HP.	3,176	—
Direct Labor:	.5 hrs/shift x 730 shifts/yr x 8.00/hr	2920	—
Supplies:			
Maintenance	Use 25% of capital costs		
Building Overhead	.25 x $ 125,920.	31,480	—
Taxes & Insurance			
Interest & Depreciation			
	Total Operating Cost	260,976	

Operating Cost Estimate

Unit Size 15,000 SCFM 5 % LEL Process Temp. 70°

Control Equipment Description

Thermal Incinerator - Case I Fume Incinerator.

No Heat Recovery - No Catalyst

Process Operating Time - 2 shifts/day - 365 days/yr = 5,840 hrs

Item	Description	Cost ($/yr)	
Utilities:			
Water,			
Steam,			
#2 Fuel Oil,	$1.50/10⁶ BTU x 22.7 x 10⁶/hr x 5840 hrs	198,852	—
Electricity,	$.03/KWH x 5840 hrs x .746 KW/HP x 24.3 HP.	3,176	—
Direct Labor:	.5 hrs/shift x 730 shifts/yr x 8.00/hr	2920	—
Supplies:			
Maintenance Building Overhead Taxes & Insurance Interest & Depreciation	Use 25% of capital costs .25 x $ 125,920.	31,480	—
	Total Operating Cost	236,428	—

Operating Cost Estimate

Unit Size 15,000 SCFM 15 % LEL Process Temp. 70°

Control Equipment Description

Thermal Incinerator - Case I Fume Incinerator

No Heat Recovery - No Catalyst

Process Operating Time - 2 shifts/day - 365 days/yr = 5,840 hrs

Item	Description	Cost ($/yr)	
Utilities:			
Water,			
Steam,			
#2 Fuel Oil,	$1.50/10⁶ BTU x 17.0 x10⁶/hr x 5840 hrs	148,920	—
Electricity,	$.03/KWH x 5840 hrs x .746 KW/HP x 24.3 HP.	3,176	—
Direct Labor:	.5 hrs/shift x 730 shifts/yr x 8.00/hr	2920	—
Supplies:			
Maintenance	Use 25% of Capital Costs		
Building Overhead	.25 x $ 125,920.	31,480	—
Taxes & Insurance			
Interest & Depreciation			
	Total Operating Cost	186,496	—

Operating Cost Estimate

Unit Size 15,000 SCFM 25 % LEL Process Temp. 70°

Control Equipment Description

Thermal Incinerator - Case I Fume Incinerator

No Heat Recovery - No Catalyst

Process Operating Time - 2 shifts/day - 365 days/yr = 5,840 hrs

Item	Description	Cost ($/yr)	
Utilities:			
Water,			
Steam,			
#2 Fuel Oil,	$1.50/10⁶ BTU x 11.3 x 10⁶/hr x 5840 hrs	98,988	—
Electricity,	$.03/KWH x 5840 hrs x .746 KW/HP x 24.3 HP.	3,176	—
Direct Labor:	.5 hrs/shift x 730 shifts/yr x 8.00/hr	2920	—
Supplies:			
Maintenance	Use 25% of capital costs		
Building Overhead			
Taxes & Insurance	.25 x $ 125,920.	31,480	—
Interest & Depreciation			
	Total Operating Cost	136,564	

Operating Cost Estimate

Unit Size 30,000 SCFM 0 % LEL Process Temp. 70°

Control Equipment Description

Thermal Incinerator - Case I Fume Incinerator

No Heat Recovery - No Catalyst

Process Operating Time - 2 shifts/day - 365 days/yr = 5,840 hrs

Item	Description	Cost ($/yr)	
Utilities:			
Water,			
Steam,			
#2 Fuel Oil,	$1.50/10⁶ BTU x 51.0 x 10⁶/hr x 5840 hrs	446,760	—
Electricity,	$.03/KWH x 5840 hrs x .746 KW/HP x 48.6 HP.	6352	—
Direct Labor:	.5 hrs/shift x 730 shifts/yr x 8.00/hr	2920	—
Supplies:			
Maintenance	Use 25% of capital costs		
Building Overhead			
Taxes & Insurance	.25 x $ 149,550	37,390	—
Interest & Depreciation			
	Total Operating Cost	493,422	—

Operating Cost Estimate

Unit Size 30,000 SCFM 5 % LEL Process Temp. 70°

Control Equipment Description

Thermal Incinerator - Case I Fume Incinerator

No Heat Recovery - No Catalyst

Process Operating Time - 2 shifts/day - 365 days/yr = 5,840 hrs

Item	Description	Cost ($/yr)	
Utilities:			
Water,			
Steam,			
#2 Fuel Oil,	$1.50/10⁶ BTU x 45.4 x 10⁶/hr x 5840 hrs	397,704	—
Electricity,	$.03/KWH x 5840 hrs x .746 KW/HP x 48.6 HP.	6,352	—
Direct Labor:	.5 hrs/shift x 730 shifts/yr x 8.00/hr	2920	—
Supplies:			
Maintenance	Use 25% of capital costs		
Building Overhead			
Taxes & Insurance	.25 x $ 149,550	37,390	—
Interest & Depreciation			
	Total Operating Cost	444,366	—

Operating Cost Estimate

Unit Size 30,000 SCFM 15% LEL Process Temp. 70°

Control Equipment Description

Thermal Incinerator - Case I Fume Incinerator

No Heat Recovery - No Catalyst

Process Operating Time - 2 shifts/day - 365 days/yr = 5,840 hrs

Item	Description	Cost ($/yr)	
Utilities:			
Water,			
Steam,			
#2 Fuel Oil,	$1.50/10⁶ BTUx 34.1 x10⁶/hr x 5840 hrs	298,716	—
Electricity,	$.03/KWH x 5840 hrs x .746 KW/HP x 48.6 HP.	6352	—
Direct Labor:	.5 hrs/shift x 730 shifts/yr x 8.00/hr	2920	—
Supplies:			
Maintenance	Use 25% of Capital Costs		
Building Overhead			
Taxes & Insurance	.25 x $ 149,550	37,390	—
Interest & Depreciation			
	Total Operating Cost	345,378	—

Operating Cost Estimate

Unit Size 30,000 SCFM 25% LEL Process Temp. 70°

Control Equipment Description

Thermal Incinerator - Case I Fume Incinerator

No Heat Recovery - No Catalyst

Process Operating Time - 2 shifts/day - 365 days/yr = 5,840 hrs

Item	Description	Cost ($/yr)	
Utilities:			
Water,			
Steam,			
#2 Fuel Oil,	$1.50/10⁶ BTU x 22.7 x 10⁶/hr x 5840 hrs	198,862	—
Electricity,	$.03/KWH x 5840 hrs x .746 KW/HP x 48.6 HP.	6352	—
Direct Labor:	.5 hrs/shift x 730 shifts/yr x 8.00/hr.	2920	—
Supplies:			
Maintenance	Use 25% of capital costs		
Building Overhead			
Taxes & Insurance	.25 x $ 149,550	37,390	—
Interest & Depreciation			
	Total Operating Cost	245,514	—

Operating Cost Estimate

Unit Size 5000 SCFM 0 % LEL Process Temp. 300°F

Control Equipment Description

Thermal Incinerator - Case I Fume Incinerator

No Heat Recovery — No Catalyst

Process Operating Time - 2 shifts/day - 365 days/yr = 5,840 hrs

Item	Description	Cost ($/yr)	
Utilities:			
Water,			
Steam,			
#2 Fuel Oil,	$1.50/10⁶ BTU × 7.1 × 10⁶/hr × 5840 hrs	62,196	
Electricity,	$.03/KWH × 5840 hrs × .746 KW/HP × 16.6 HP.	2170	
Direct Labor:	.5 hrs/shift × 730 shifts/yr × 8.00/hr	2920	—
Supplies:			
Maintenance Building Overhead Taxes & Insurance Interest & Depreciation	Use 25% of capital costs .25 × $ 101,755	25445	—
	Total Operating Cost	92,731	—

Operating Cost Estimate

Unit Size 5000 SCFM 5 % LEL Process Temp. 300°F

Control Equipment Description

Thermal Incinerator - Case I Fume Incinerator

No Heat Recovery — No Catalyst

Process Operating Time - 2 shifts/day - 365 days/yr = 5,840 hrs

Item	Description	Cost ($/yr)	
Utilities:			
Water,			
Steam,			
#2 Fuel Oil,	$1.50/10⁶ BTU x 6.2 x10⁶/hr x 5840 hrs	54,312	—
Electricity,	$.03/KWH x 5840 hrs x .746 KW/HP x 16.6 HP.	2170	—
Direct Labor:	.5 hrs/shift x 730 shifts/yr x 8.00/hr	2920	—
Supplies:			
Maintenance Building Overhead Taxes & Insurance Interest & Depreciation	Use 25% of capital costs .25 x $ 101,755	25445	—
	Total Operating Cost	84,857	—

OPERATING COST ESTIMATE

UNIT SIZE 5000 SCFM 15 % LEL PROCESS TEMP. 300°F

CONTROL EQUIPTMENT DESCRIPTION

THERMAL INCINERATOR - CASE I FUME INCINERATOR

NO HEAT RECOVERY — NO CATALYST

PROCESS OPERATING TIME - 2 SHIFTS/DAY - 365 DAYS/YR = 5,840 HRS

ITEM	DESCRIPTION	COST ($/YR)	
UTILITIES:			
WATER,			
STEAM,			
#2 FUEL OIL,	$1.50/10⁶ BTU × 4.3 ×10⁶/HR × 5840 HRS	37,668	—
ELECTRICITY,	$.03/KWH × 5840 HRS × .746 KW/HP × 16.6 HP.	2170	
DIRECT LABOR:	.5 HRS/SHIFT × 730 SHIFTS/YR × 8.00/HR	2920	—
SUPPLIES:			
MAINTENANCE	USE 25% OF CAPITAL COSTS		
BUILDING OVERHEAD	.25 × $ 101,755	25445	—
TAXES & INSURANCE			
INTEREST & DEPRECIATION			
	TOTAL OPERATING COST	68,203	—

Operating Cost Estimate

Unit Size 5000 SCFM 25 % LEL Process Temp. 300°F

Control Equipment Description

Thermal Incinerator - Case I Fume Incinerator

No Heat Recovery — No Catalyst

Process Operating Time - 2 shifts/day - 365 days/yr = 5,840 hrs

Item	Description	Cost ($/yr)	
Utilities:			
Water,			
Steam,			
#2 Fuel Oil,	$1.50/$10^6$ BTU x 2.4 x 10^6/hr x 5840 hrs	21,024	
Electricity,	$.03/KWH x 5840 hrs x .746 KW/HP x 16.6 HP.	2170	
Direct Labor:	.5 hrs/shift x 730 shifts/yr x 8.00/hr	2920	—
Supplies:			
Maintenance	Use 25% of capital costs		
Building Overhead			
Taxes & Insurance	.25 x $ 101,755	25445	—
Interest & Depreciation			
	Total Operating Cost	51,559	

Operating Cost Estimate

Unit Size 15,000 SCFM 0 % LEL Process Temp. 300°F

Control Equipment Description

Thermal Incinerator - Case I Fume Incinerator

No Heat Recovery — No Catalyst

Process Operating Time - 2 shifts/day - 365 days/yr = 5,840 hrs

Item	Description	Cost ($/yr)	
Utilities:			
Water,			
Steam,			
#2 Fuel Oil,	$1.50/10⁶ BTU x 21.4 x 10⁶/hr x 5840 hrs	187,464	—
Electricity,	$.03/KWH x 5840 hrs x .746 KW/HP x 49.8 HP.	6,509	—
Direct Labor:	.5 hrs/shift x 730 shifts/yr x 8.00/hr	2920	—
Supplies:			
Maintenance	Use 25% of capital costs		
Building Overhead			
Taxes & Insurance	.25 x $ 125,920.	31,480	
Interest & Depreciation			
	Total Operating Cost	228,373	

Operating Cost Estimate

Unit Size 15,000 SCFM 5 % LEL Process Temp. 300°F

Control Equiptment Description

Thermal Incinerator - Case I Fume Incinerator

No Heat Recovery — No Catalyst

Process Operating Time - 2 shifts/day - 365 days/yr = 5,840 hrs

Item	Description	Cost ($/yr)	
Utilities:			
Water,			
Steam,			
#2 Fuel Oil,	$1.50/10⁶ BTU x 18.6 x 10⁶/hr x 5840 hrs	162,936	—
Electricity,	$.03/KWH x 5840 hrs x .746 KW/HP x 49.8 HP.	6,509	—
Direct Labor:	.5 hrs/shift x 730 shifts/yr x 8.00/hr	2920	—
Supplies:			
Maintenance	Use 25% of Capital Costs		
Building Overhead			
Taxes & Insurance	.25 x $ 125,920.	31,480	
Interest & Depreciation			
	Total Operating Cost	203,845	

Operating Cost Estimate

Unit Size 15,000 SCFM 15 % LEL Process Temp. 300°F

Control Equipment Description

Thermal Incinerator - Case I Fume Incinerator

No Heat Recovery — No Catalyst

Process Operating Time - 2 shifts/day - 365 days/yr = 5,840 hrs

Item	Description	Cost ($/yr)	
Utilities:			
Water,			
Steam,			
#2 Fuel Oil,	$1.50/10⁶ BTU x 12.9 x 10⁶/hr x 5840 hrs	113,004	—
Electricity,	$.03/KWH x 5840 hrs x .746 KW/HP x 49.8 HP.	6,509	—
Direct Labor:	.5 hrs/shift x 730 shifts/yr x 8.00/hr	2920	—
Supplies:			
Maintenance	Use 25% of Capital Costs		
Building Overhead			
Taxes & Insurance	.25 x $ 125,920.	31,480	
Interest & Depreciation			
	Total Operating Cost	153,913	

Operating Cost Estimate

Unit Size 15,000 SCFM 25% LEL Process Temp. 300°F

Control Equipment Description

Thermal Incinerator - Case I Fume Incinerator

No Heat Recovery — No Catalyst

Process Operating Time - 2 shifts/day - 365 days/yr = 5,840 hrs

Item	Description	Cost ($/yr)	
Utilities:			
Water,			
Steam,			
#2 Fuel Oil,	$1.50/10⁶ BTUX 7.3 x 10⁶/hr x 5840 hrs	63,948	—
Electricity,	$.03/KWH x 5840 hrs x .746 KW/HP x 49.8 HP.	6,509	—
Direct Labor:	.5 hrs/shift x 730 shifts/yr x 8.00/hr	2920	—
Supplies:			
Maintenance, Building Overhead, Taxes & Insurance, Interest & Depreciation	Use 25% of Capital Costs .25 x $ 125,920.	31,480	
	Total Operating Cost	104,857	

Operating Cost Estimate

Unit Size 30,000 SCFM 0 % LEL Process Temp. 300°F

Control Equipment Description

Thermal Incinerator - Case I Fume Incinerator

No Heat Recovery - No Catalyst

Process Operating Time - 2 shifts/day - 365 days/yr = 5,840 hrs

Item	Description	Cost ($/yr)	
Utilities:			
Water,			
Steam,			
#2 Fuel Oil,	$1.50/10⁶ BTUX 42.9 x 10⁶/hr x 5840 hrs	375,804	—
Electricity,	$.03/KWH x 5840 hrs x .746 KW/HP x 99.6 HP.	13,018	—
Direct Labor:	.5 hrs/shift x 730 shifts/yr x 8.00/hr	2920	—
Supplies:			
Maintenance	Use 25% of capital costs		
Building Overhead			
Taxes & Insurance	.25 x $ 149,550.	37,390	—
Interest & Depreciation			
	Total Operating Cost	429,132	—

OPERATING COST ESTIMATE

UNIT SIZE 30,000 SCFM 5% LEL PROCESS TEMP. 300°F

CONTROL EQUIPTMENT DESCRIPTION

THERMAL INCINERATOR - CASE I FUME INCINERATOR

NO HEAT RECOVERY - NO CATALYST

PROCESS OPERATING TIME - 2 SHIFTS/DAY - 365 DAYS/YR = 5,840 HRS

ITEM	DESCRIPTION	COST ($/YR)	
UTILITIES:			
WATER,			
STEAM,			
#2 FUEL OIL,	$1.50/10⁶ BTUX 37.2 x10⁶/HR x 5840 HRS	325,872	—
ELECTRICITY,	$.03/KWH x 5840 HRS x .746 KW/HP x 99.6 HP.	13,018	—
DIRECT LABOR:	.5 HRS/SHIFT x 730 SHIFTS/YR x 8.00/HR	2920	—
SUPPLIES:			
MAINTENANCE BUILDING OVERHEAD TAXES & INSURANCE INTEREST & DEPRECIATION	USE 25% OF CAPITAL COSTS .25 x $ 149,550.	37,390	—
	TOTAL OPERATING COST $	379,200	—

Operating Cost Estimate

Unit Size 30,000 SCFM 15 % LEL Process Temp. 300°F

Control Equipment Description

Thermal Incinerator - Case I Fume Incinerator

No Heat Recovery - No Catalyst

Process Operating Time - 2 shifts/day - 365 days/yr = 5,840 hrs

Item	Description	Cost ($/yr)	
Utilities:			
Water,			
Steam,			
#2 Fuel Oil,	$1.50/10⁶ BTU x 25.9 x 10⁶/hr x 5840 hrs	226,884	—
Electricity,	$.03/KWH x 5840 hrs x .746 KW/HP x 99.6 HP.	13,018	—
Direct Labor:	.5 hrs/shift x 730 shifts/yr x 8.00/hr	2920	—
Supplies:			
Maintenance	Use 25% of capital costs		
Building Overhead			
Taxes & Insurance	.25 x $ 149,550.	37,390	—
Interest & Depreciation			
	Total Operating Cost	280,212	

Operating Cost Estimate

Unit Size 30,000 SCFM 25 % LEL Process Temp. 300°F

Control Equipment Description

Thermal Incinerator - Case I Fume Incinerator

No Heat Recovery - No Catalyst

Process Operating Time - 2 shifts/day - 365 days/yr = 5,840 hrs

Item	Description	Cost ($/yr)	
Utilities:			
Water,			
Steam,			
#2 Fuel Oil,	$1.50/10⁶ BTUx 14.5 x10⁶/hr x 5840 hrs	127,020	—
Electricity,	$.03/KWH x 5840 hrs x .746 KW/HP x 99.6 HP.	13,018	—
Direct Labor:	.5 hrs/shift x 730 shifts/yr x 8.00/hr	2920	—
Supplies:			
Maintenance Building Overhead Taxes & Insurance Interest & Depreciation	Use 25% of Capital Costs .25 x $ 149,550.	37,390	—
	Total Operating Cost	180,348	

Operating Cost Estimate

Unit Size 5000 SCFM 0 % LEL Process Temp. 70°F

Control Equipment Description

Thermal Incinerator - Case I Fume Incinerator With Catalyst – No Heat Recovery

Process Operating Time - 2 shifts/day - 365 days/yr = 5,840 hrs

Item	Description	Cost ($/yr)	
Utilities:			
Water,			
Steam,			
#2 Fuel Oil,	$1.50/10⁶ BTU x 3.1 x 10⁶/hr x 5840 hrs	27,156	—
Electricity,	$.03/KWH x 5840 hrs x .746 KW/HP x 10.4 HP.	1,360	—
Replace Catalyst,	0.4141 x $14,500. (3 yr life)	6,005	—
Direct Labor:	.5 hrs/shift x 730 shifts/yr x 8.00/hr	2920	—
Supplies:			
Maintenance Building Overhead Taxes & Insurance Interest & Depreciation	Use 25% of capital costs .25 x $ 76,845	19,215	—
	Total Operating Cost	56,656	—

Operating Cost Estimate

Unit Size 5000 SCFM 5 % LEL Process Temp. 70°F

Control Equipment Description

Thermal Incinerator - Case I Fume Incinerator with Catalyst - No Heat Recovery

Process Operating Time - 2 shifts/day - 365 days/yr = 5,840 hrs

Item	Description	Cost ($/yr)	
Utilities:			
Water,			
Steam,			
#2 Fuel Oil,	$1.50/10⁶ BTU x 3.1 x 10⁶/hr x 5840 hrs	27,156	—
Electricity,	$.03/KWH x 5840 hrs x .746 KW/HP x 10.4 HP.	1,360	—
Replace Catalst,	0.4141 x 14,500. (3 yr life	6005	—
Direct Labor:	.5 hrs/shift x 730 shifts/yr x 8.00/hr	2920	—
Supplies:			
Maintenance	Use 25% of capital costs		
Building Overhead			
Taxes & Insurance	.25 x $ 76,845	19,215	—
Interest & Depreciation			
	Total Operating Cost	56,656	—

Operating Cost Estimate

Unit Size 5000 SCFM 15 % LEL Process Temp. 70°F

Control Equipment Description

Thermal Incinerator - Case I Fume Incinerator With Catalyst - No Heat Recovery

Process Operating Time - 2 shifts/day - 365 days/yr = 5,840 hrs

Item	Description	Cost ($/yr)	
Utilities:			
Water,			
Steam,			
#2 Fuel Oil,	$1.50/10⁶ BTU x 3.1 x 10⁶/hr x 5840 hrs	27,156	—
Electricity,	$.03/KWH x 5840 hrs x .746 KW/HP x 10.0 HP.	1360	—
Replace Catalyst,	0.4141 x $ 14,500. (3 yrs life)	6005	—
Direct Labor:	.5 hrs/shift x 730 shifts/yr x 8.00/hr	2920	—
Supplies:			
Maintenance, Building Overhead, Taxes & Insurance, Interest & Depreciation	Use 25% of capital costs .25 x $ 104,525	26,135	—
	Total Operating Cost	63,576	—

Operating Cost Estimate

Unit Size 5000 SCFM 25% LEL Process Temp. 70°F

Control Equipment Description

Thermal Incinerator - Case I Fume Incinerator With Catalyst - No Heat Recovery

Process Operating Time - 2 shifts/day - 365 days/yr = 5,840 hrs

Item	Description	Cost ($/yr)	
Utilities:			
Water,			
Steam,			
#2 Fuel Oil,	$1.50/10⁶ BTU x 2.5 x 10⁶/hr x 5840 hrs	21,900	—
Electricity,	$.03/KWH x 5840 hrs x .746 KW/HP x 10.4 HP.	1360	—
Replace Catalyst,	0.4141 x $14,500 (3 yr life)	6,005	—
Direct Labor:	.5 hrs/shift x 730 shifts/yr x 8.00/hr	2920	—
Supplies:			
Maintenance	Use 25% of Capital Costs		
Building Overhead			
Taxes & Insurance	.25 x $ 104,525	26,135	—
Interest & Depreciation			
	Total Operating Cost	58,320	—

Operating Cost Estimate

Unit Size 15,000 SCFM 0 % LEL Process Temp. 70°F

Control Equipment Description

Thermal Incinerator - Case I Fume Incinerator With Catalyst - No Heat Recovery

Process Operating Time - 2 shifts/day - 365 days/yr = 5,840 hrs

Item	Description	Cost ($/yr)	
Utilities:			
Water,			
Steam,			
#2 Fuel Oil,	$1.50/10⁶ BTU x 9.4 x 10⁶/hr x 5840 hrs	82,344	—
Electricity,	$.03/KWH x 5840 hrs x .746 KW/HP x 31.3 HP.	4091	—
Replace Catalyst,	0.414 x $43,500. (3 yrs life)	18,014	—
Direct Labor:	.5 hrs/shift x 730 shifts/yr x 8.00/hr	2920	—
Supplies:			
Maintenance Building Overhead Taxes & Insurance Interest & Depreciation	Use 25% of capital costs .25 x $ 136,080	34,020	—
	Total Operating Cost	$91,389	

Operating Cost Estimate

Unit Size 15000 SCFM 5 % LEL Process Temp. 70°F

Control Equipment Description

Thermal Incinerator - Case I Fume Incinerator With Catalyst - No Heat Recovery

Process Operating Time - 2 shifts/day - 365 days/yr = 5,840 hrs

Item	Description	Cost ($/yr)	
Utilities:			
Water,			
Steam,			
#2 Fuel Oil,	$1.50/10⁶ BTU x 9.4 x 10⁶/hr x 5840 hrs	82,344	—
Electricity,	$.03/KWH x 5840 hrs x .746 KW/HP x 31.3 HP.	4091	—
Replace Catalyst,	0.4141 x $43,500 (3 yrs life)	18014	—
Direct Labor:	.5 hrs/shift x 730 shifts/yr x 8.00/hr	2920	—
Supplies:			
Maintenance	Use 25% of capital costs		
Building Overhead			
Taxes & Insurance	.25 x $ 136,080	34,020	—
Interest & Depreciation			
	Total Operating Cost	141,389	—

Operating Cost Estimate

Unit Size 15000 SCFM 15 % LEL Process Temp. 70°F

Control Equipment Description

Thermal Incinerator - Case I Fume Incinerator

With Catalyst - No Heat Recovery

Process Operating Time - 2 shifts/day - 365 days/yr = 5,840 hrs

Item	Description	Cost ($/yr)	
Utilities:			
Water,			
Steam,			
#2 Fuel Oil,	$1.50/10⁶ BTUx 9.4 x10⁶/hr x 5840 hrs	82344	—
Electricity,	$.03/KWH x 5840 hrs x .746 KW/HP x 31.3 HP.	4091	—
Replace Catalyst,	0.41ft³ x 43,500 (3 yrs life)	18014	—
Direct Labor:	.5 hrs/shift x 730 shifts/yr x 8.00/hr	2920	—
Supplies:			
Maintenance Building Overhead Taxes & Insurance Interest & Depreciation	Use 25% of capital costs .25 x $ 154,750	38,690	—
	Total Operating Cost	146,059	—

Operating Cost Estimate

Unit Size 15000 SCFM 25 % LEL Process Temp. 70°F

Control Equipment Description

Thermal Incinerator - Case I Fume Incinerator With Catalyst - No Heat Recovery

Process Operating Time - 2 shifts/day - 365 days/yr = 5,840 hrs

Item	Description	Cost ($/yr)	
Utilities:			
Water,			
Steam,			
#2 Fuel Oil,	$1.50/10⁶ BTUx 7.6 x10⁶/hr x 5840 hrs	66,576	—
Electricity,	$.03/KWH x 5840 hrs x .746 KW/HP x 31.3 HP.	4091	—
Replace Catalyst,	0.4141 x $43,500. (3 yrs life)	18014	—
Direct Labor:	.5 hrs/shift x 730 shifts/yr x 8.00/hr	2920	—
Supplies:			
Maintenance, Building Overhead, Taxes & Insurance, Interest & Depreciation	Use 25% of capital costs .25 x $154,750	38,690	—
	Total Operating Cost	130,291	

Operating Cost Estimate

Unit Size 30,000 SCFM 0% LEL Process Temp. 70°F

Control Equipment Description

Thermal Incinerator - Case I Fume Incinerator With Catalyst — No Heat Recovery

Process Operating Time - 2 shifts/day - 365 days/yr = 5,840 hrs

Item	Description	Cost ($/yr)	
Utilities:			
Water,			
Steam,			
#2 Fuel Oil,	$1.50/10⁶ BTUX 18.8 x 10⁶/hr x 5840 hrs	164688	
Electricity,	$.03/KWH x 5840 hrs x .746 KW/HP x 62.6 HP.	8182	
Replace Catalyst,	0.414) x $87,000. (3 yrs life)	36,027	—
Direct Labor:	.5 hrs/shift x 730 shifts/yr x 8.00/hr	2920	—
Supplies:			
Maintenance	Use 25% of capital costs		
Building Overhead			
Taxes & Insurance	.25 x $ 204410	51103	—
Interest & Depreciation			
	Total Operating Cost	262,920	

Operating Cost Estimate

Unit Size 30,000 SCFM 5 % LEL Process Temp. 70°F

Control Equipment Description

Thermal Incinerator - Case I Fume Incinerator

With Catalyst — No Heat Recovery

Process Operating Time - 2 shifts/day - 365 days/yr = 5,840 hrs

Item	Description	Cost ($/yr)	
Utilities:			
Water,			
Steam,			
#2 Fuel Oil,	$1.50/$10^6$ BTU x 18.8 x 10^6/hr x 5840 hrs	164688	—
Electricity,	$.03/KWH x 5840 hrs x .746 KW/HP x 62.6 HP.	8182	—
Replace Catalyst,	0.4141 x $87,000. (3 yrs life)	36,027	—
Direct Labor:	.5 hrs/shift x 730 shifts/yr x 8.00/hr	2920	—
Supplies:			
Maintenance			
Building Overhead	use 25% of capital costs		
Taxes & Insurance	.25 x $ 204,410	51103	—
Interest & Depreciation			
	Total Operating Cost	262,920	

Operating Cost Estimate

Unit Size 30,000 SCFM 15 % LEL Process Temp. 70°F

Control Equipment Description

Thermal Incinerator - Case I Fume Incinerator

With Catalyst — No Heat Recovery

Process Operating Time - 2 shifts/day - 365 days/yr = 5,840 hrs

Item	Description	Cost ($/yr)	
Utilities:			
Water,			
Steam,			
#2 Fuel Oil,	$1.50/10⁶ BTUx 18.8 x10⁶/hr x 5840 hrs	164688	—
Electricity,	$.03/KWH x 5840 hrs x .746 KW/HP x 62.6 HP.	8182	—
Replace Catalyst,	0.4141 x $87,000. (3 yrs life)	36027	—
Direct Labor:	.5 hrs/shift x 730 shifts/yr x 8.00/hr	2920	—
Supplies:			
Maintenance	Use 25% of capital costs		
Building Overhead			
Taxes & Insurance	.25 x $ 220,255	55064	—
Interest & Depreciation			
	Total Operating Cost	266,881	

Operating Cost Estimate

Unit Size 30,000 SCFM 25 % LEL Process Temp. 70°F

Control Equipment Description

Thermal Incinerator - Case I Fume Incinerator With Catalyst — No Heat Recovery

Process Operating Time - 2 shifts/day - 365 days/yr = 5,840 hrs

Item	Description	Cost ($/yr)	
Utilities:			
Water,			
Steam,			
#2 Fuel Oil,	$1.50/10⁶ BTU x 15.2 x 10⁶/hr x 5840 hrs	133152	—
Electricity,	$.03/KWH x 5840 hrs x .746 KW/HP x 62.6 HP.	8182	—
Replace Catalyst,	0.41141 x $87,000 (3 yrs life)	36027	—
Direct Labor:	.5 hrs/shift x 730 shifts/yr x 8.00/hr	2920	—
Supplies:			
Maintenance	Use 25% of capital costs		
Building Overhead			
Taxes & Insurance	.25 x $ 220,255	55064	—
Interest & Depreciation			
	Total Operating Cost	235,345	

Operating Cost Estimate

Unit Size 5000 SCFM 0 % LEL Process Temp. 300°F

Control Equipment Description

Thermal Incinerator - Case I - Fume Incinerator With Catalyst - No Heat Recovery

Process Operating Time - 2 shifts/day - 365 days/yr = 5,840 hrs

Item	Description	Cost ($/yr)	
Utilities:			
Water,			
Steam,			
#2 Fuel Oil,	$1.50/10⁶ BTU × 1.8 × 10⁶/hr × 5840 hrs	15,768	—
Electricity,	$.03/KWH × 5840 hrs × .746 KW/HP × 21.4 HP.	2797	—
Replace Catalyst,	0.4141 × $14,500. (3 yrs life)	6005	—
Direct Labor:	.5 hrs/shift × 730 shifts/yr × 8.20/hr	2920	—
Supplies:			
Maintenance Building Overhead Taxes & Insurance Interest & Depreciation	Use 25% of capital costs .25 × $ 76,845	19,215	—
	Total Operating Cost	46,705	—

Operating Cost Estimate

Unit Size 5000 SCFM 5 % L.E.L Process Temp. 300°F

Control Equipment Description

Thermal Incinerator - Case I Fume Incinerator With Catalyst - No Heat Recovery

Process Operating Time - 2 shifts/day - 365 days/yr = 5,840 hrs

Item	Description	Cost ($/yr)	
Utilities:			
Water,			
Steam,			
#2 Fuel Oil,	$1.50/10⁶ BTU x 1.8 x 10⁶/hr x 5840 hrs	15,768	—
Electricity,	$.03/KWH x 5840 hrs x .746 KW/HP x 21.4 HP.	2797	—
Replace Catalyst,	0.4141 x $14,500. (3 yrs life)	6005	—
Direct Labor:	.5 hrs/shift x 730 shifts/yr x 8.00/hr	2920	—
Supplies:			
Maintenance	Use 25% of Capital Costs		
Building Overhead			
Taxes & Insurance	.25 x $76,845	19215	—
Interest & Depreciation			
	Total Operating Cost	46,705	—

Operating Cost Estimate

Unit Size 5000 SCFM 15 % LEL Process Temp. 300°F

Control Equipment Description

Thermal Incinerator - Case I Fume Incinerator With Catalyst - No Heat Recovery

Process Operating Time - 2 shifts/day - 365 days/yr = 5,840 hrs

Item	Description	Cost ($/yr)	
Utilities:			
Water,			
Steam,			
#2 Fuel Oil,	$1.50/10⁶ BTU x 1.8 x 10⁶/hr x 5840 hrs	15,768	—
Electricity,	$.03/KWH x 5840 hrs x .746 KW/HP x 21.4 HP.	2797	—
Replace Catalyst,	0.4141 x $ 14,500. (3 yrs life)	6005	—
Direct Labor:	.5 hrs/shift x 730 shifts/yr x 8.00/hr	2920	—
Supplies:			
Maintenance	Use 25% of capital costs		
Building Overhead			
Taxes & Insurance	.25 x $ 104,525	26,135	—
Interest & Depreciation			
	Total Operating Cost	53,625	

Operating Cost Estimate

Unit Size 5000 SCFM 25 % LEL Process Temp. 300°F

Control Equipment Description

Thermal Incinerator - Case I Fume Incinerator With Catalyst - No Heat Recovery

Process Operating Time - 2 shifts/day - 365 days/yr = 5,840 hrs

Item	Description	Cost ($/yr)	
Utilities:			
Water,			
Steam,			
#2 Fuel Oil,	$1.50/10⁶ BTU x 1.2 x 10⁶/hr x 5840 hrs	10,512	—
Electricity,	$.03/KWH x 5840 hrs x .746 KW/HP x 21.4 HP.	2797	—
Replace Catalyst,	0.4141 x $ 14,500. (3 yrs life)	6005	—
Direct Labor:	.5 hrs/shift x 730 shifts/yr x 8.20/hr	2920	—
Supplies:			
Maintenance Building Overhead Taxes & Insurance Interest & Depreciation	Use 25% of capital costs .25 x $ 104,525	26,135	—
	Total Operating Cost	48,369	—

Operating Cost Estimate

Unit Size 15000 SCFM 0 % LEL Process Temp. 300°F

Control Equipment Description

Thermal Incinerator - Case I Fume Incinerator With Catalyst - No Heat Recovery

Process Operating Time - 2 shifts/day - 365 days/yr = 5,840 hrs

Item	Description	Cost ($/yr)	
Utilities:			
Water,			
Steam,			
#2 Fuel Oil,	$1.50/10⁶ BTU x 5.4 x 10⁶/hr x 5840 hrs	47,304	—
Electricity,	$.03/KWH x 5840 hrs x .746 KW/HP x 64.2 HP.	8391	—
Replace Catalyst,	0.4141 x $43,500. (3 yrs life)	18,014	—
Direct Labor:	.5 hrs/shift x 730 shifts/yr x 8.00/hr	2920	—
Supplies:			
Maintenance, Building Overhead, Taxes & Insurance, Interest & Depreciation	Use 25% of capital costs .25 x $ 136,080	34020	—
	Total Operating Cost	110,649	

Operating Cost Estimate

Unit Size 15000 SCFM 5 % LEL Process Temp. 300°F

Control Equipment Description

Thermal Incinerator - Case I Fume Incinerator with Catalyst - No Heat Recovery

Process Operating Time - 2 shifts/day - 365 days/yr = 5,840 hrs

Item	Description	Cost ($/yr)
Utilities:		
Water,		
Steam,		
#2 Fuel Oil,	$1.50/10⁶ BTUx 5.4 x10⁶/hr x 5840 hrs	47,304 —
Electricity,	$.03/KWH x 5840 hrs x .746 KW/HP x 64.2 HP.	8391
Replace Catalyst,	0.4141 x $43,500. (3 yrs life)	18,014 —
Direct Labor:	.5 hrs/shift x 730 shifts/yr x 8.00/hr	2920 —
Supplies:		
Maintenance Building Overhead Taxes & Insurance Interest & Depreciation	Use 25% of capital costs .25 x $ 136,080	34020 —
	Total Operating Cost	110,649

OPERATING COST ESTIMATE

UNIT SIZE 15,000 SCFM 15 % LEL PROCESS TEMP. 300°F

CONTROL EQUIPTMENT DESCRIPTION

THERMAL INCINERATOR - CASE I FUME INCINERATOR WITH CATALYST - NO HEAT RECOVERY

PROCESS OPERATING TIME - 2 SHIFTS/DAY - 365 DAYS/YR = 5,840 HRS

ITEM	DESCRIPTION	COST ($/YR)	
UTILITIES:			
WATER,			
STEAM,			
#2 FUEL OIL,	$1.50/$10^6$ BTU X 5.4 x 10^6/HR X 5840 HRS	47,304	—
ELECTRICITY,	$.03/KWH X 5840 HRS X .746 KW/HP X 64.2 HP.	8391	
REPLACE CATALYST,	0.4141 X $43,500. (3 YRS LIFE)	18014	—
DIRECT LABOR:	.5 HRS/SHIFT X 730 SHIFTS/YR X 8.00/HR	2920	—
SUPPLIES:			
MAINTENANCE, BUILDING OVERHEAD, TAXES & INSURANCE, INTREST & DEPRECIATION	USE 25% OF CAPITAL COSTS .25 X $ 154,750 —	38,690	—
	TOTAL OPERATING COST	115,319	

Operating Cost Estimate

Unit Size 15000 SCFM 25 % LEL Process Temp. 300°F

Control Equipment Description

Thermal Incinerator - Case I Fume Incinerator with Catalyst - No Heat Recovery

Process Operating Time - 2 shifts/day - 365 days/yr = 5,840 hrs

Item	Description	Cost ($/yr)
Utilities:		
Water,		
Steam,		
#2 Fuel Oil,	$1.50/$10^6$ BTU x 3.6 x 10^6/hr x 5840 hrs	31,560 —
Electricity,	$.03/KWH x 5840 hrs x .746 KW/HP x 64.2 HP.	8391 —
Replace Catalyst,	0.4141 x $43,500. (3 yrs life)	18,014 —
Direct Labor:	.5 hrs/shift x 730 shifts/yr x 8.20/hr	2920 —
Supplies:		
Maintenance	Use 25% of capital costs	
Building Overhead		
Taxes & Insurance	.25 x $ 154,750	38688 —
Interest & Depreciation		
	Total Operating Cost	99,573 —

OPERATING COST ESTIMATE

UNIT SIZE 30,000 SCFM 0 % LEL : PROCESS TEMP. 300°

CONTROL EQUIPTMENT DESCRIPTION

THERMAL INCINERATOR - CASE I FUME INCINERATOR WITH CATALYST — NO HEAT RECOVERY

PROCESS OPERATING TIME - 2 SHIFTS/DAY - 365 DAYS/YR = 5,840 HRS

ITEM	DESCRIPTION	COST ($/YR)
UTILITIES:		
WATER,		
STEAM,		
#2 FUEL OIL,	$1.50/10⁶ BTU X 10.6 x 10⁶/HR X 5840 HRS	94608
ELECTRICITY,	$.03/KWH X 5840 HRS X .746 KW/HP X 128.5 HP:	16795
REPLACE CATALYST,	0.4141 X $87,000. (3 YRS LIFE)	36,027 —
DIRECT LABOR:	.5 HRS/SHIFT X 730 SHIFTS/YR X 8.00/HR	2920 —
SUPPLIES:		
MAINTENANCE BUILDING OVERHEAD TAXES & INSURANCE INTREST & DEPRECIATION	USE 25% OF CAPITAL COSTS .25 X $ 204,410	51103
	TOTAL OPERATING COST	201,453

Operating Cost Estimate

Unit Size 30,000 SCFM 5% LEL Process Temp. 300°F

Control Equipment Description

Thermal Incinerator - Case I Fume Incinerator With Catalyst - No Heat Recovery

Process Operating Time - 2 shifts/day - 365 days/yr = 5,840 hrs

Item	Description	Cost ($/yr)	
Utilities:			
Water,			
Steam,			
#2 Fuel Oil,	$1.50/10⁶ BTU x 10.8 x 10⁶/hr x 5840 hrs	94608	—
Electricity,	$.03/KWH x 5840 hrs x .746 KW/HP x 128.5 HP.	16795	—
Replace. Catalyst,	0.4141 x $87,000. (3 yr life)	36027	—
Direct Labor:	.5 hrs/shift x 730 shifts/yr x 8.00/hr	2920	—
Supplies:			
Maintenance Building Overhead Taxes & Insurance Interest & Depreciation	Use 25% of capital costs .25 x $ 204,410	51103	—
	Total Operating Cost	201453	

Operating Cost Estimate

Unit Size 30,000 SCFM 15% LEL Process Temp. 300°F

Control Equipment Description

Thermal Incinerator - Case I Fume Incinerator With Catalyst — No Heat Recovery

Process Operating Time - 2 shifts/day - 365 days/yr = 5,840 hrs

Item	Description	Cost ($/yr)
Utilities:		
Water,		
Steam,		
#2 Fuel Oil,	$1.50/10⁶ BTU x 10.8 x 10⁶/hr x 5840 hrs	94608
Electricity,	$.03/KWH x 5840 hrs x .746 KW/HP x 128.5 HP.	16795
Replace Catalyst,	0.414 x 87,500. (3 yrs life)	36,027 —
Direct Labor:	.5 hrs/shift x 730 shifts/yr x 8.20/hr	2920 —
Supplies:		
Maintenance	Use 25% of capital costs	
Building Overhead	.25 x $ 220,255	55064 — —
Taxes & Insurance		
Interest & Depreciation		
	Total Operating Cost	205444

Operating Cost Estimate

Unit Size 30,000 SCFM 25 % LEL Process Temp. 300°F

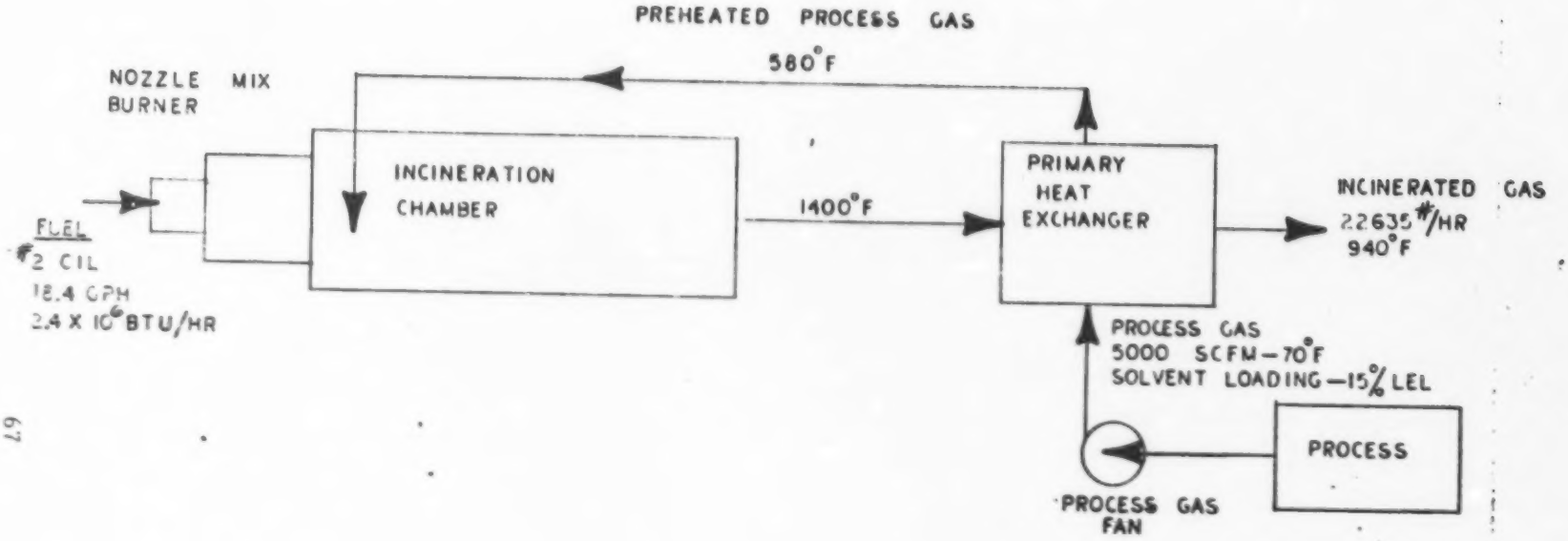
Control Equipment Description

Thermal Incinerator - Case I Fume Incinerator With Catalyst — No Heat Recovery

Process Operating Time - 2 shifts/day - 365 days/yr = 5,840 hrs

Item	Description	Cost ($/yr)
Utilities:		
Water,		
Steam,		
#2 Fuel Oil,	$1.50/10⁶ BTUx 7.1 x10⁶/hr x 5840 hrs	62196 —
Electricity,	$.03/KWH x 5840 hrs x .746 KW/HP x 128.5 HP.	16795 —
Replace Catalyst,	0.414 x 87,500 (3 yrs life)	36,027 —
Direct Labor:	.5 hrs/shift x 730 shifts/yr x 8.00/hr	2920 —
Supplies:		
Maintenance	Use 25% of capital costs	
Building Overhead		
Taxes & Insurance	.25 x $ 220,255	55064 —
Interest & Depreciation		
	Total Operating Cost	173,002

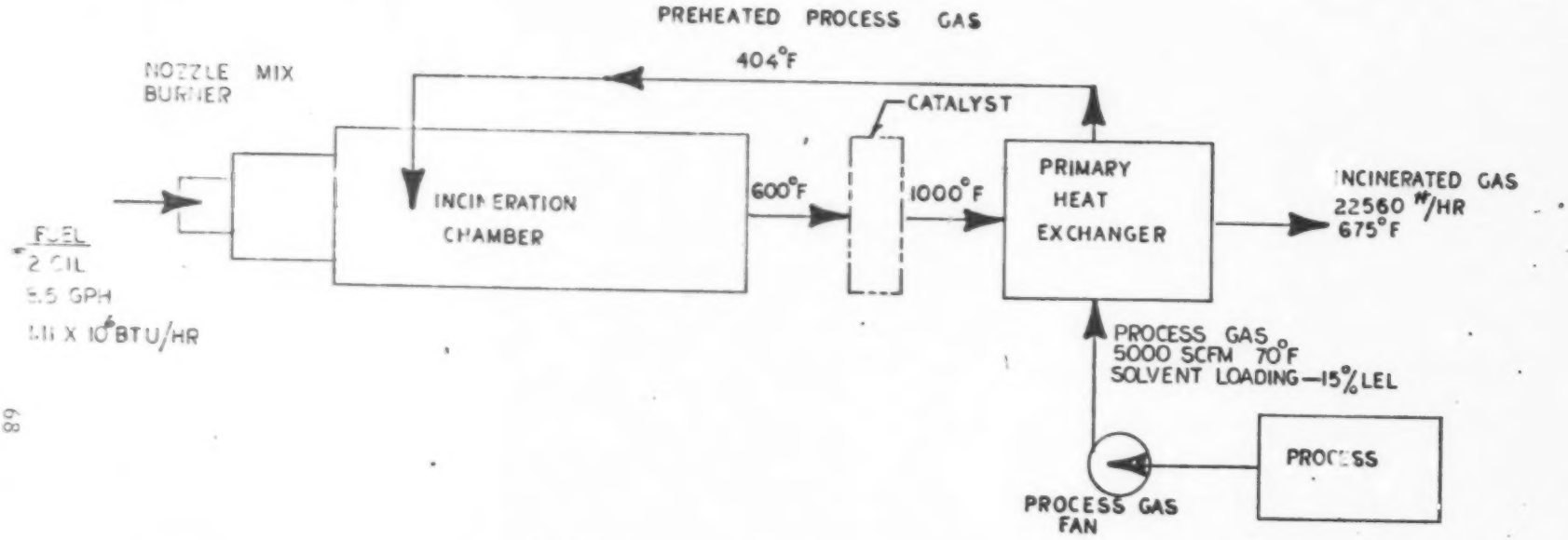
CASE 2. INCINERATION WITH PRIMARY HEAT RECOVERY



TYPICAL CASE 2

(PRIMARY HEAT RECOVERY AND NO CATALYST)

Preceding page blank



TYPICAL CASE 2
(PRIMARY HEAT RECOVERY
WITH CATALYST)

CASE 2
WITH HEAT EXCHANGER
NO CATALYST
70°F INLET TEMPERATURE
1400°F INCINERATION TEMPERATURE

PROCESS GAS FLOW IN SCFM	PROCESS GAS FLOW IN ACFM	PROCESS GAS FLOW IN #/HR.	PROCESS GAS FLOW INCINERATED GAS FLOW #/HR.	PROCESS GAS FLOW INLET TEMPERATURE °F	PREHEAT TEMPERATURE °F	INCINERATION TEMPERATURE °F	OUTLET TEMPERATURE °F	LEL %	HEAT RELEASE BTU/CF (MET)	HEAT RELEASE 10^6 BTU/HR.	BURNER REQUIREMENTS 10^6 BTU/HR. NET	BURNER REQUIREMENTS 10^6 BTU/HR. GROSS	HEAT EXCHANGER EFFICIENCY %
5,000	5,000	22,500	22,782	70	582	1,400	942	0	0	0	5.07	5.39	38.5
5,000	5,000	22,500	22,733	70	581	1,400	941	5	2.83	0.85	4.19	4.46	38.4
5,000	5,000	22,500	22,635	70	580	1,400	940	15	8.47	2.54	2.42	2.58	38.4
5,000	5,000	22,500	22,538	70	579	1,400	939	25	14.11	4.23	0.68	0.73	38.4
15,000	15,000	67,500	68,356	70	582	1,400	942	0	0	0	15.40	16.38	38.5
15,000	15,000	67,500	68,207	70	581	1,400	941	5	2.83	2.54	12.71	13.52	38.4
15,000	15,000	67,500	67,908	70	580	1,400	940	15	8.47	7.62	7.34	7.81	38.4
15,000	15,000	67,500	67,609	70	579	1,400	939	25	14.11	12.71	1.96	2.09	38.3
30,000	30,000	135,000	136,691	70	582	1,400	942	0	0	0	30.41	32.35	38.5
30,000	30,000	135,000	136,398	70	581	1,400	941	5	2.83	5.08	25.13	26.74	38.4
30,000	30,000	135,000	135,808	70	580	1,400	940	15	8.47	15.23	14.54	15.46	38.4
30,000	30,000	135,000	135,218	70	579	1,400	939	25	14.11	25.40	3.92	4.17	38.3

CASE 2
WITH HEAT EXCHANGER
NO CATALYST
300°F INLET TEMPERATURE
1400°F INCINERATION TEMPERATURE

PROCESS GAS FLOW IN SCFM	PROCESS GAS FLOW IN ACFM	PROCESS GAS FLOW IN #/HR.	INCINERATED GAS FLOW #/HR.	PROCESS GAS FLOW INLET TEMPERATURE °F	PROCESS GAS FLOW PREHEAT TEMPERATURE °F	INCINERATION TEMPERATURE °F	OUTLET TEMPERATURE °F	LEL %	HEAT RELEASE BTU/CF (NET)	HEAT RELEASE 10^6 BTU/HR.	BURNER REQUIREMENTS 10^6 BTU/HR. NET	BURNER REQUIREMENTS 10^6 BTU/HR. GROSS	HEAT EXCHANGER EFFICIENCY %
5,000	7,170	22,500	22,734	300	725	1,400	1,013	0	0	0	4.21	4.48	38.7
5,000	7,170	22,500	22,685	300	725	1,400	1,012	5	2.83	0.85	3.32	3.54	38.6
5,000	7,170	22,500	22,587	300	724	1,400	1,011	15	8.47	2.54	1.56	1.66	38.5
5,000	7,170	22,500	22,500	300	723	1,400	1,010	25	14.11	4.23	* .42	* .45	38.4
15,000	21,509	67,500	68,210	300	725	1,400	1,013	0	0	0	12.77	13.58	38.7
15,000	21,509	67,500	68,061	300	725	1,400	1,012	5	2.83	2.54	10.09	10.73	38.6
15,000	21,509	67,500	67,763	300	724	1,400	1,011	15	8.47	7.62	4.73	5.03	38.5
15,000	21,509	67,500	67,464	300	723	1,400	1,010	25	14.11	12.71	*1.31	*1.40	38.4
30,000	43,019	135,000	136,406	300	725	1,400	1,013	0	0	0	25.28	26.90	38.7
30,000	43,019	135,000	136,111	300	725	1,400	1,012	5	2.83	5.08	19.97	21.25	38.6
30,000	43,019	135,000	135,521	300	724	1,400	1,011	15	8.47	15.23	9.38	9.97	38.5
30,000	43,019	135,000	135,000	300	723	1,400	1,010	25	14.11	25.40	*2.53	*2.7	38.4

*Burner at minimum fire, incinerated gases are bypassed around primary heat exchanger.

CASE 2
WITH PRIMARY HEAT EXCHANGER
WITH CATALYST
70°F INLET TEMPERATURE

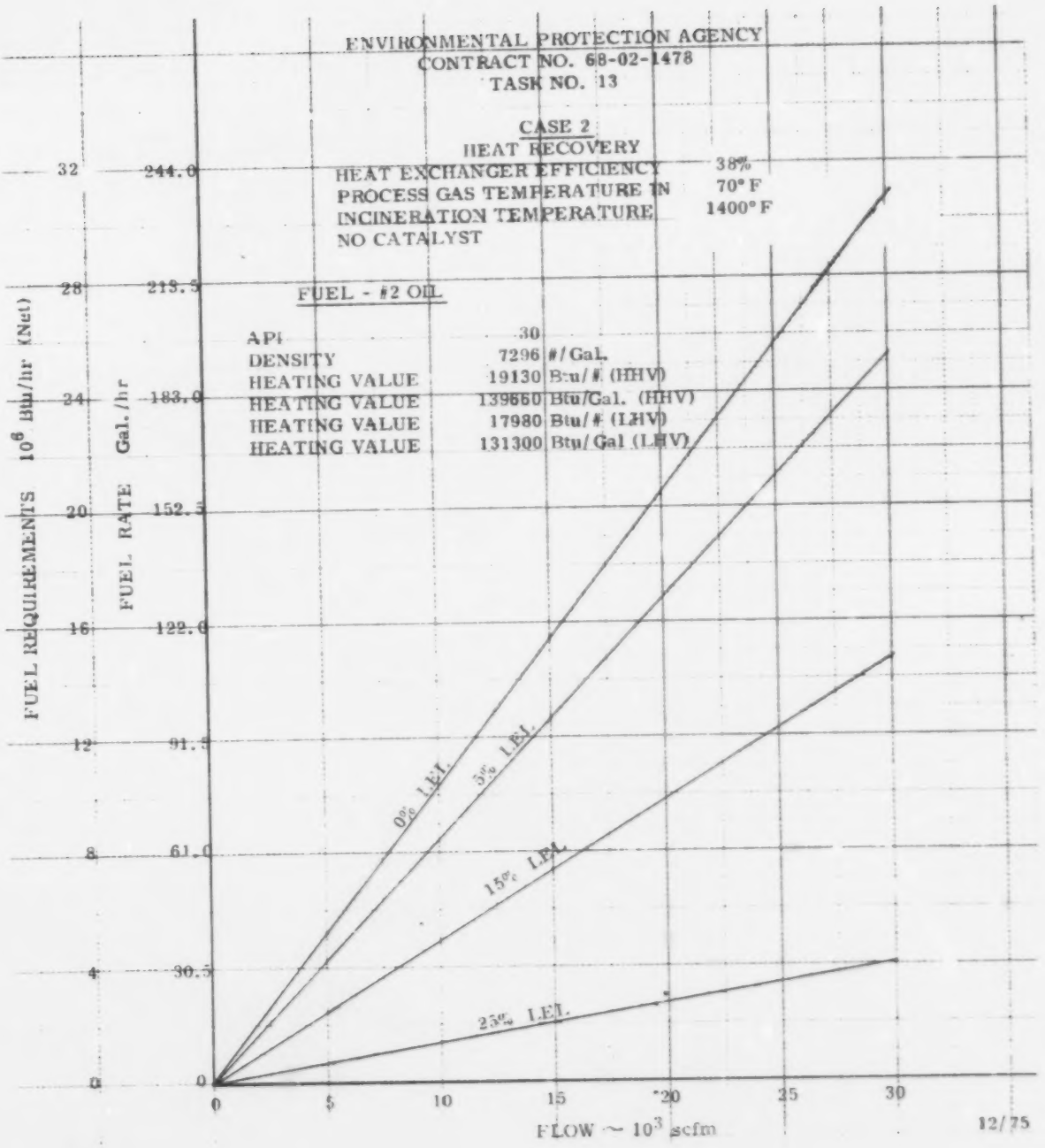
PROCESS GAS FLOW SCFM	PROCESS GAS FLOW #/HR.	PROCESS GAS FLOW THRU CATALYST #/HR.	PROCESS GAS TEMPERATURE IN °F	PROCESS GAS PREHEAT TEMPERATURE °F	GAS TEMPERATURE INTO CATALYST °F	GAS TEMPERATURE LEAVE CATALYST °F	GAS TEMPERATURE LEAVE HEAT EXCHANGER °F	HEAT EXCHANGER EFFICIENCY %	LEL %	HEAT RELEASE FROM CATALYST 10^6 BTU/HR.	BURNER REQUIREMENTS 10^6 BTU/HR. NET	BURNER REQUIREMENTS 10^6 BTU/HR. GROSS
5,000	22,500	22,606	70	260	600	600	416	35.9	0	0	1.91	2.03
5,000	22,500	22,590	70	310	600	740	506	35.9	5	0.815	1.63	1.72
5,000	22,500	22,560	70	404	600	1,000	675	36.0	15	2.34	1.11	1.19
5,000	22,500	22,507	70	479	515	*1,210	806	36.2	25	4.06	* .19	* .2
15,000	67,500	67,820	70	260	600	600	416	35.9	0	0	5.73	6.10
15,000	67,500	67,772	70	310	600	740	506	35.9	5	2.44	4.89	5.02
15,000	67,500	67,685	70	404	600	1,000	675	36.0	15	7.31	3.32	3.54
15,000	67,500	67,520	70	479	515	*1,210	806	36.2	25	12.20	* .57	* .61
30,000	135,000	135,638	70	260	600	600	416	35.9	0	0	11.46	12.20
30,000	135,000	135,545	70	310	600	740	506	35.9	5	4.88	9.80	10.43
30,000	135,000	135,370	70	404	600	1,000	675	36.0	15	14.62	6.65	7.08
30,000	135,000	135,040	70	479	515	*1,210	806	36.2	25	24.39	*1.15	*1.22

*Burner is at minimum fire.
Gas temp. into catalyst is lower than what is generally recommended.
Gas temp. leaving catalyst is higher than what is generally recommended.

CASE 2
WITH PRIMARY HEAT EXCHANGER
WITH CATALYST
300°F INLET TEMPERATURE

PROCESS GAS FLOW SCFM	PROCESS GAS FLOW #/HR.	PROCESS GAS FLOW THRU CATALYST #/HR.	PROCESS GAS TEMPERATURE IN °F	PROCESS GAS PREHEAT TEMPERATURE °F	GAS TEMPERATURE INTO CATALYST °F	GAS TEMPERATURE LEAVE CATALYST °F	GAS TEMPERATURE LEAVE HEAT EXCHANGER °F	HEAT EXCHANGER EFFICIENCY %	LEL %	HEAT RELEASE FROM CATALYST 10^6 BTU/HR.	BURNER REQUIREMENTS 10^6 BTU/HR. NET	BURNER REQUIREMENTS 10^6 BTU/HR. GROSS
5,000	22,500	22,563	300	400	600	600	493	36.5	0	0	1.13	1.21
5,000	22,500	22,590	300	460	600	740	583	36.6	5	0.815	0.79	0.84
5,000	22,500	22,540	300	555	600	1,000	750	36.8	15	2.34	0.26	0.27
5,000	22,500	22,500	300	*635	635	1,315	910	36.9	25	4.06	**	**
15,000	67,500	67,690	300	400	600	600	493	36.5	0	0	3.39	3.62
15,000	67,500	67,632	300	460	600	740	583	36.6	5	2.44	2.38	2.53
15,000	67,500	67,543	300	555	600	1,000	750	36.8	15	7.31	.77	.82
15,000	67,500	67,500	300	*635	635	1,315	910	36.9	25	12.20	**	**
30,000	135,000	135,377	300	400	600	600	493	36.5	0	0	6.78	7.21
30,000	135,000	135,265	300	460	600	740	583	36.6	5	4.88	4.76	5.07
30,000	135,000	135,086	300	555	600	1,000	750	36.8	15	14.62	1.54	1.65
30,000	135,000	135,000	300	*635	635	1,315	910	36.9	25	24.39	**	**

*Preheat Temperature higher than minimum required temperature into catalyst, gas temp. leaving catalyst is higher than good design.
**No burner required due to high preheat temperature.


ENVIRONMENTAL PROTECTION AGENCY
CONTRACT NO. 68-02-1478
TASK NO. 13
CASE 2
HEAT RECOVERY
HEAT EXCHANGER EFFICIENCY 38%
PROCESS GAS TEMPERATURE IN 70° F
INCINERATION TEMPERATURE 1400° F
NO CATALYST
FUEL - #2 OIL
API 30
DENSITY 7296 #/Gal.
HEATING VALUE 19130 Btu/# (HHV)
HEATING VALUE 139660 Btu/Gal. (HHV)
HEATING VALUE 17980 Btu/# (LHV)
HEATING VALUE 131300 Btu/Gal (LHV)
FUEL REQUIREMENTS 10^6 Btu/hr (Net)
FUEL RATE Gal./hr
32
28
24
20
16
12
8
4
0
244.0
213.5
183.0
152.5
122.0
91.5
61.0
30.5
0
0% LEL
5% LEL
15% LEL
25% LEL
0
5
10
15
20
25
30
FLOW ~ 10^3 scfm
12/75

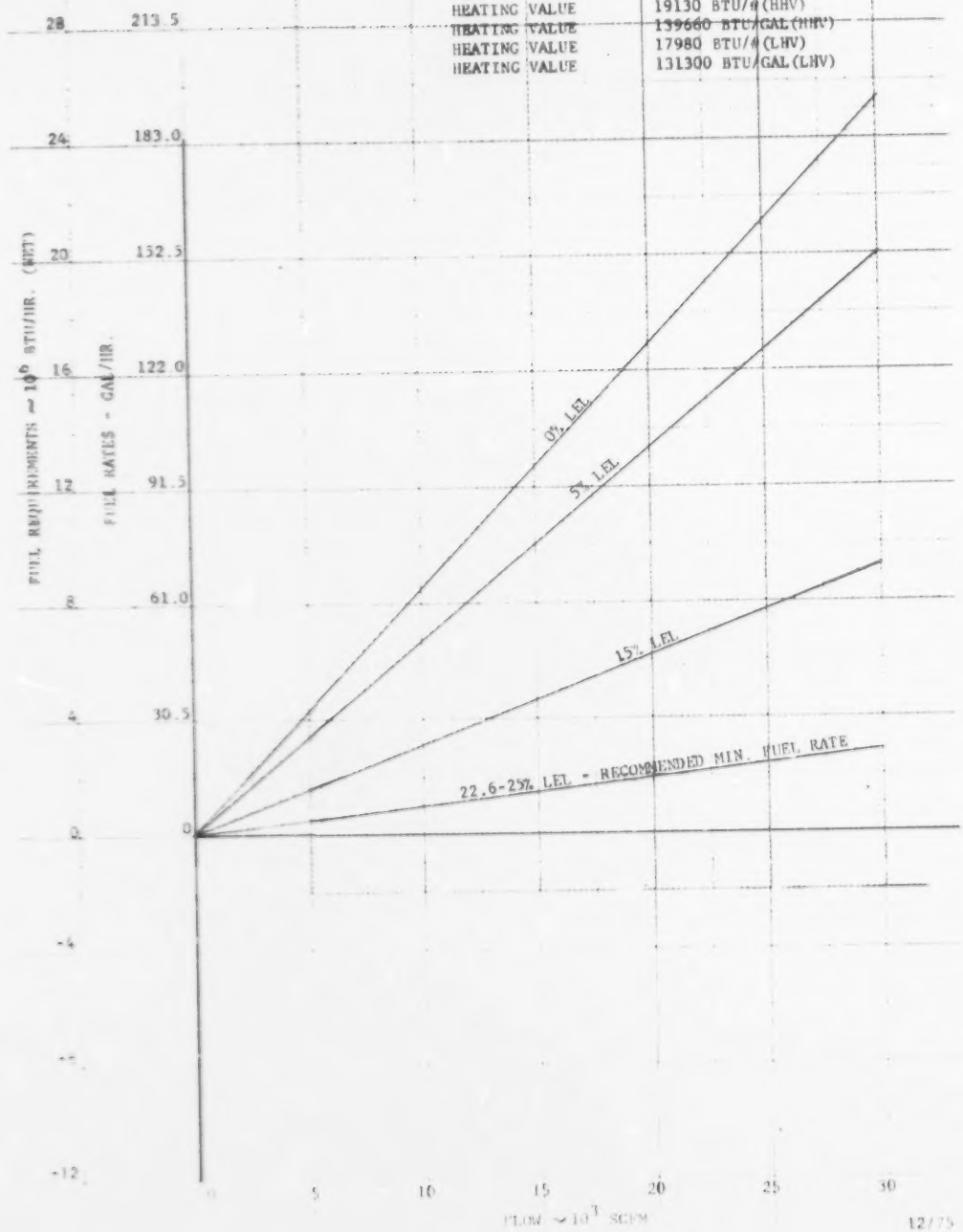
ENVIRONMENTAL PROTECTION AGENCY
CONTRACT NO. 68-02-1478
TASK NO. 13

CASE 2

HEAT RECOVERY
HEAT EXCHANGER EFFICIENCY 38%
PROCESS GAS TEMPERATURE IN 300°F
INCINERATION TEMPERATURE 1400°F
NO CATALYST

FUEL - #2 OIL

APT	30
DENSITY	7.296 #/GAL
HEATING VALUE	19130 BTU/#(HHV)
HEATING VALUE	139660 BTU/GAL(HHV)
HEATING VALUE	17980 BTU/#(LHV)
HEATING VALUE	131300 BTU/GAL(LHV)



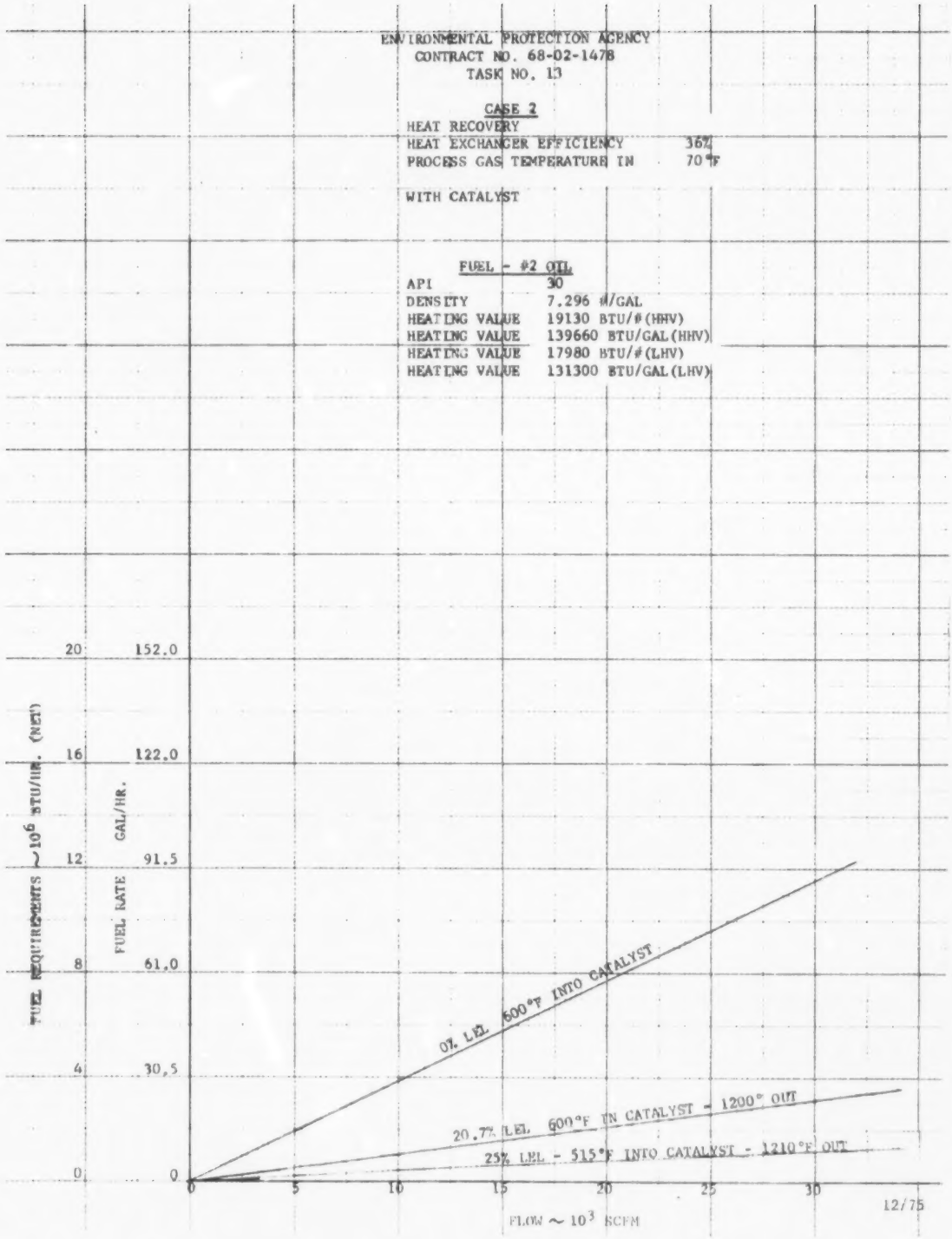
12/75

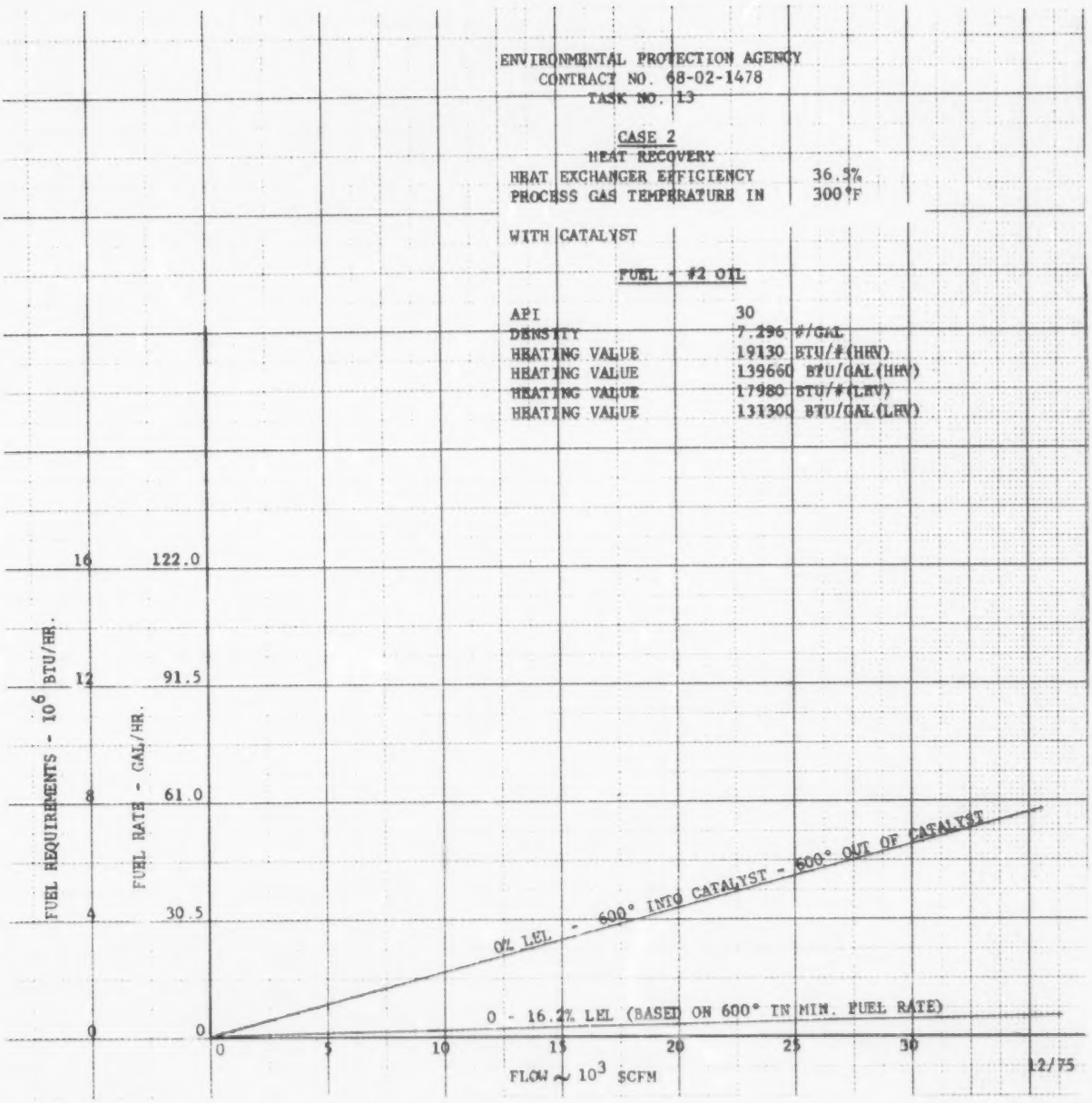
ENVIRONMENTAL PROTECTION AGENCY
CONTRACT NO. 68-02-1478
TASK NO. 13

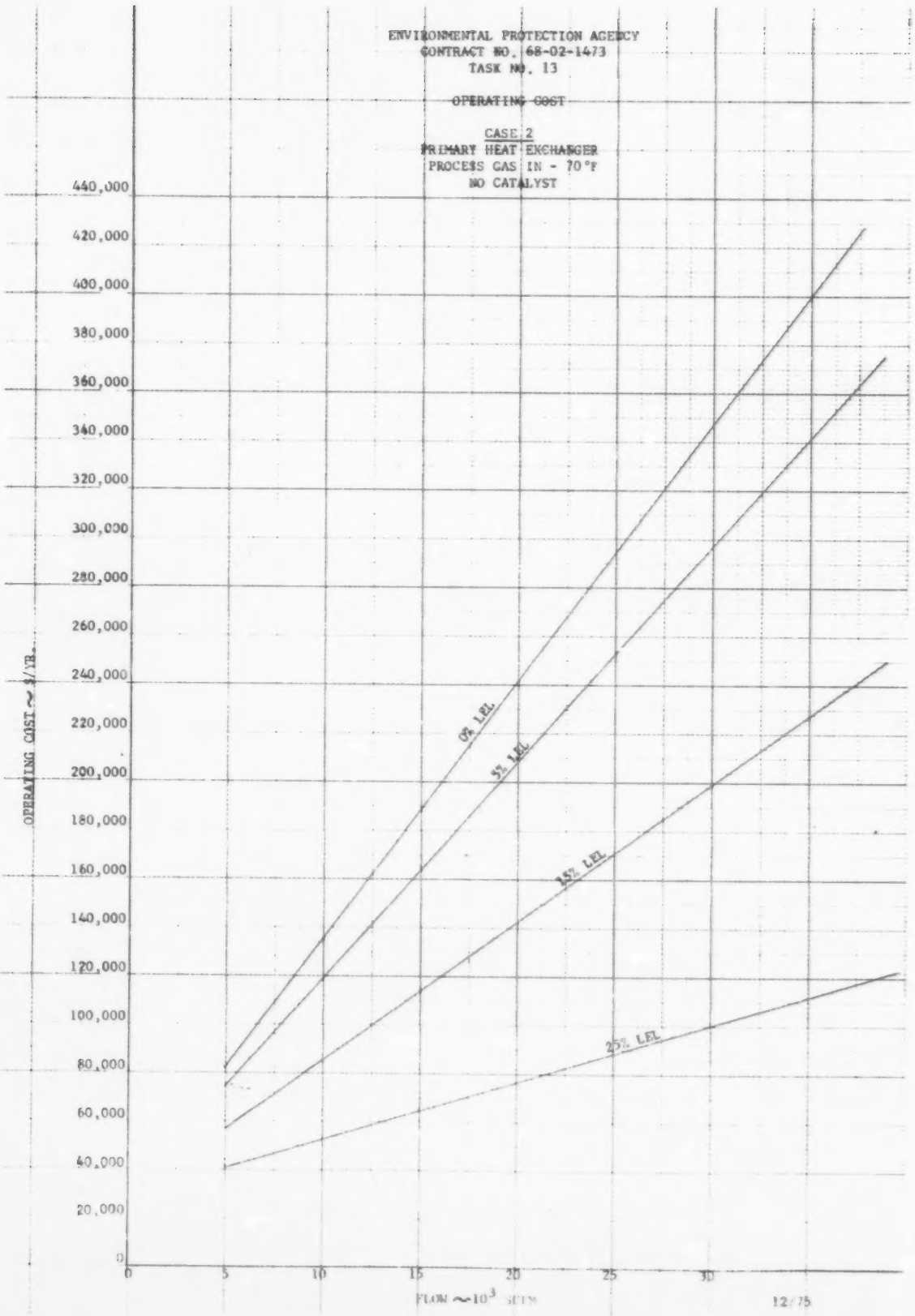
CASE 2
HEAT RECOVERY
HEAT EXCHANGER EFFICIENCY 36%
PROCESS GAS TEMPERATURE IN 70 °F

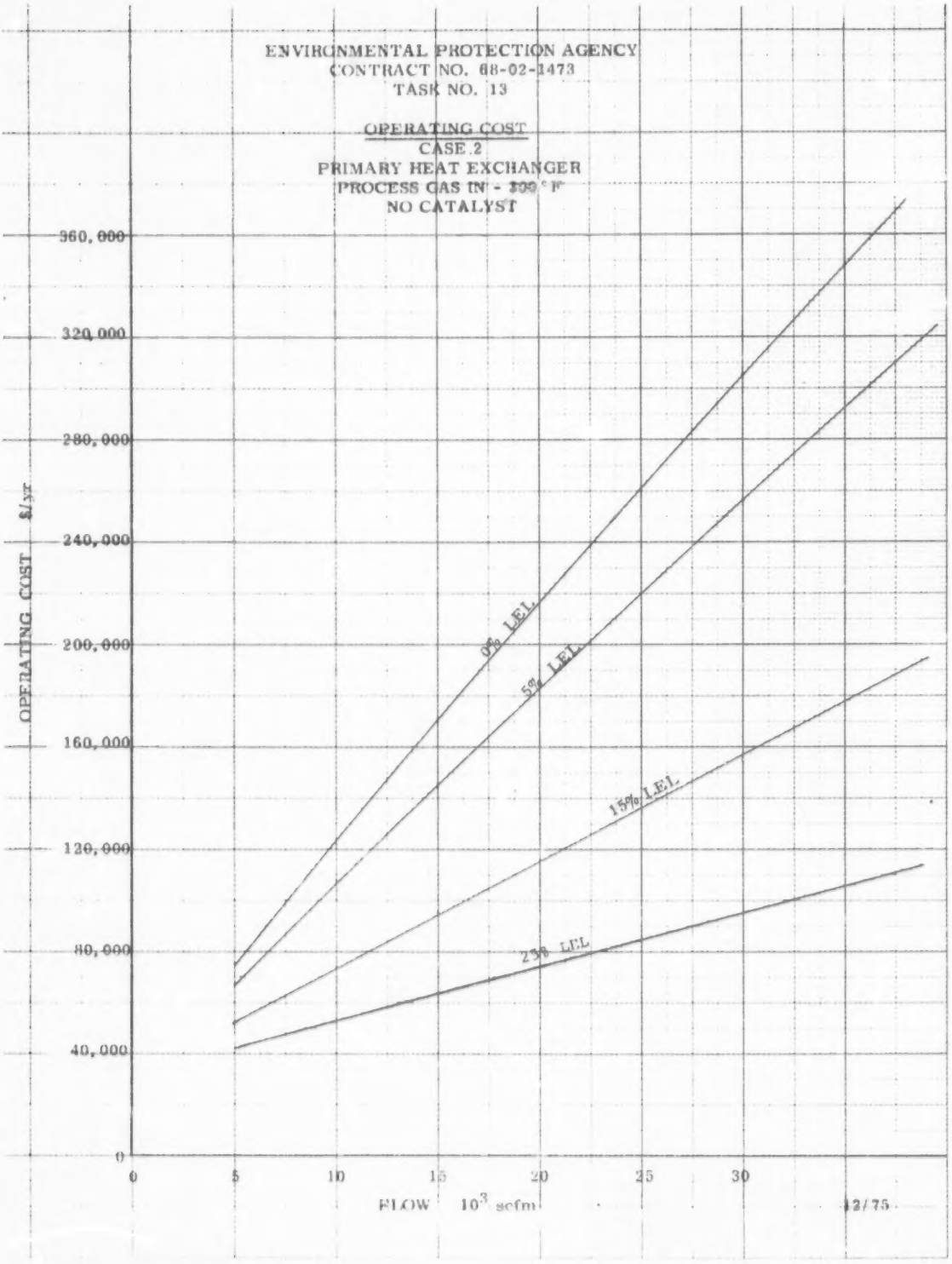
WITH CATALYST

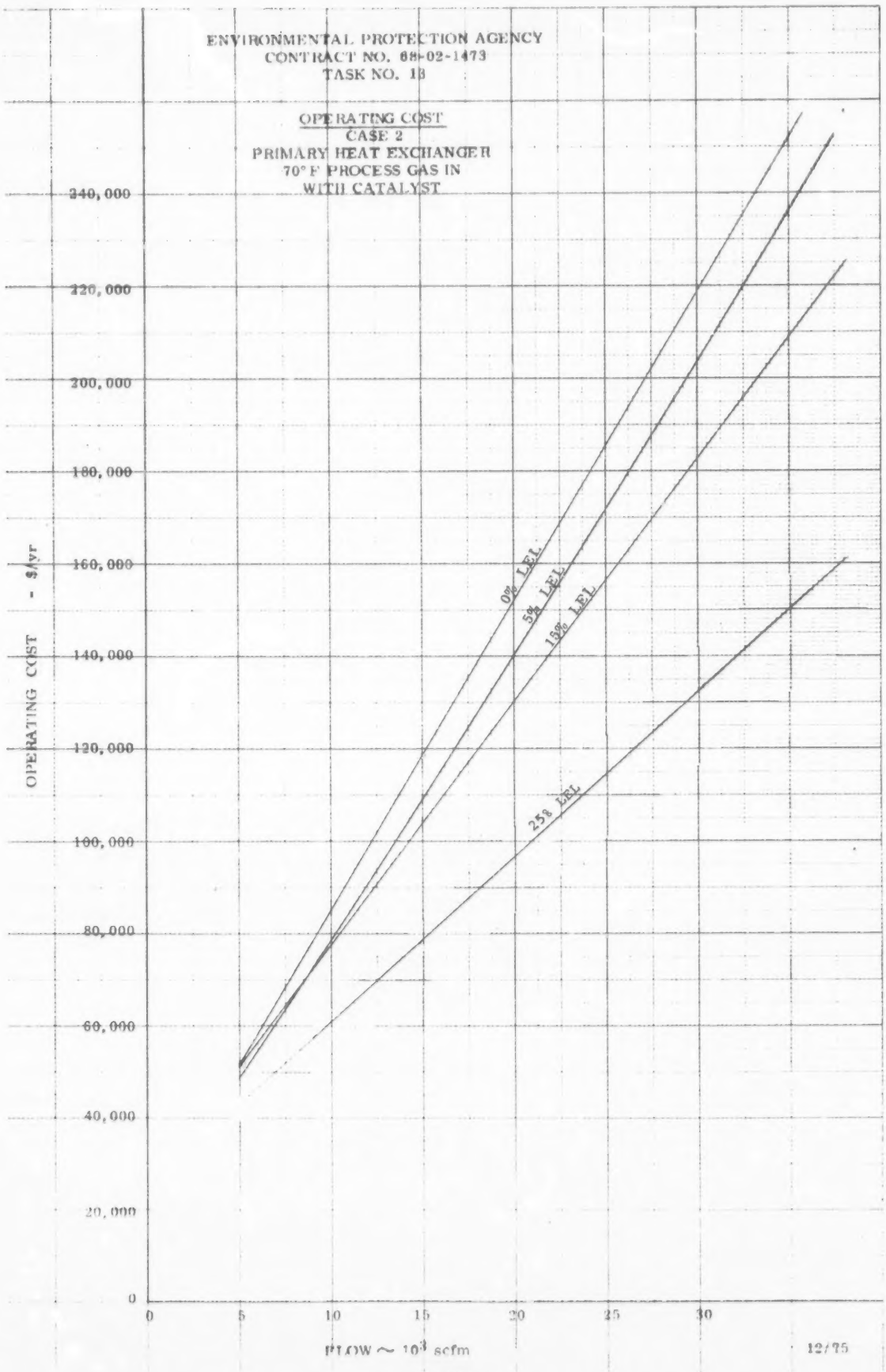
FUEL - #2 OIL
API 30
DENSITY 7.296 #/GAL
HEATING VALUE 19130 BTU/#(HHV)
HEATING VALUE 139660 BTU/GAL(HHV)
HEATING VALUE 17980 BTU/#(LHV)
HEATING VALUE 131300 BTU/GAL(LHV)

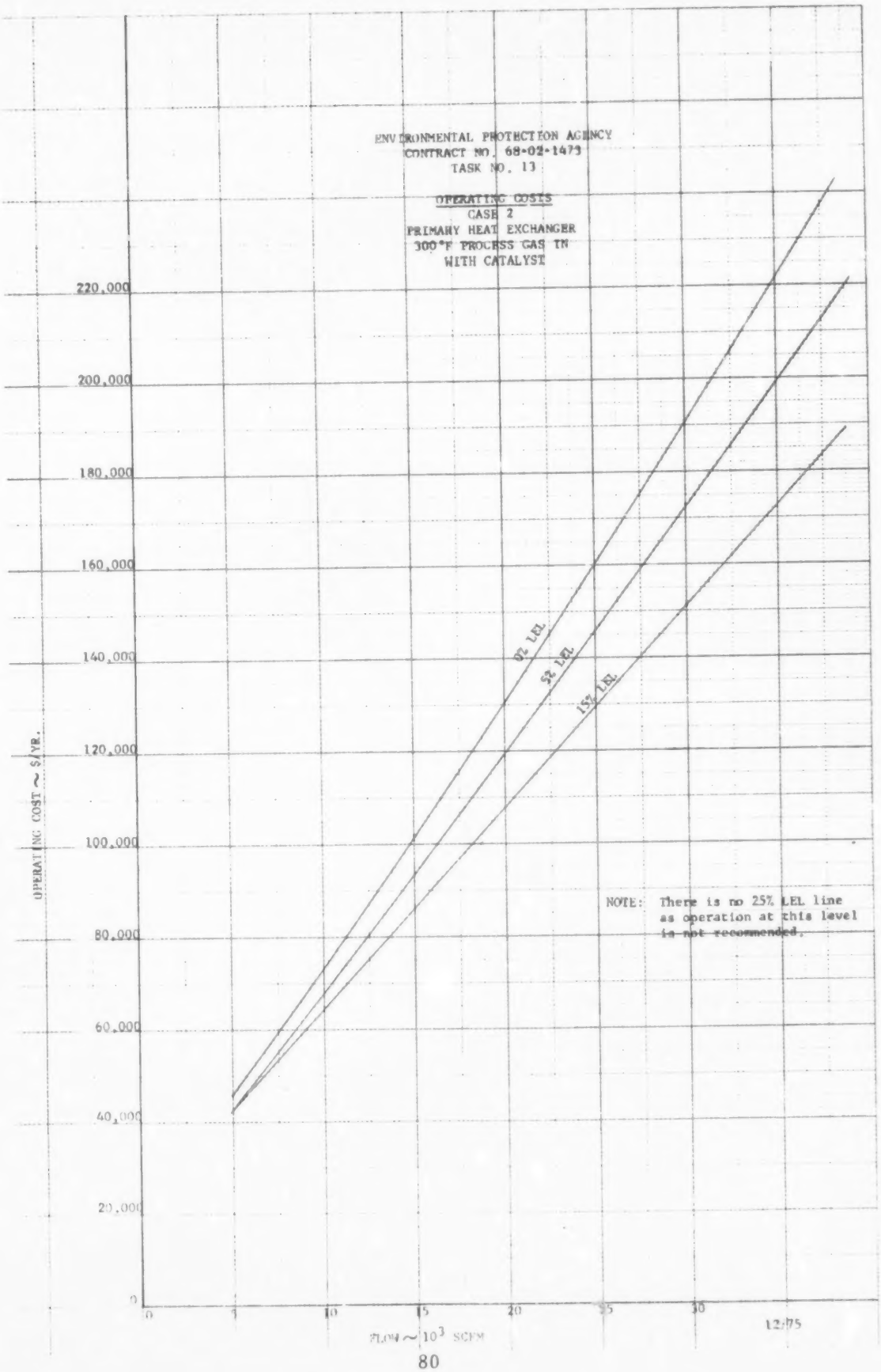



ENVIRONMENTAL PROTECTION AGENCY
CONTRACT NO. 68-02-1478
TASK NO. 13
CASE 2
HEAT RECOVERY
HEAT EXCHANGER EFFICIENCY 36.5%
PROCESS GAS TEMPERATURE IN 300°F
WITH CATALYST
FUEL - #2 OIL
API 30
DENSITY 7.296 #/GAL
HEATING VALUE 19130 BTU/#(HHV)
HEATING VALUE 139660 BTU/GAL(HHV)
HEATING VALUE 17980 BTU/#(LHV)
HEATING VALUE 131300 BTU/GAL(LHV)
FUEL REQUIREMENTS - 10^6 BTU/HR.
FUEL RATE - GAL/HR.
16 122.0
12 91.5
8 61.0
4 30.5
0 0
0% LEL - 600° INTO CATALYST - 600° OUT OF CATALYST
0 - 16.2% LEL (BASED ON 600° IN MIN. FUEL RATE)
0 5 10 15 20 25 30
FLOW ~ 10^3 SCFM
12/75


ENVIRONMENTAL PROTECTION AGENCY
CONTRACT NO. 68-02-1473
TASK NO. 13
OPERATING COST
CASE 2
PRIMARY HEAT EXCHANGER
PROCESS GAS IN - 70°F
NO CATALYST
OPERATING COST ~ $/YR.
440,000
420,000
400,000
380,000
360,000
340,000
320,000
300,000
280,000
260,000
240,000
220,000
200,000
180,000
160,000
140,000
120,000
100,000
80,000
60,000
40,000
20,000
0
0% LEL
5% LEL
15% LEL
25% LEL
0
5
10
15
20
25
30
FLOW ~10³ SCFM
12/75


ENVIRONMENTAL PROTECTION AGENCY
CONTRACT NO. 68-02-1473
TASK NO. 13
OPERATING COST
CASE 2
PRIMARY HEAT EXCHANGER
PROCESS GAS IN - 300 °F
NO CATALYST
OPERATING COST $/yr
360,000
320,000
280,000
240,000
200,000
160,000
120,000
80,000
40,000
0
0% LEL
5% LEL
15% LEL
25% LEL
0
5
10
15
20
25
30
FLOW 10^3 scfm
12/75


ENVIRONMENTAL PROTECTION AGENCY
CONTRACT NO. 68-02-1473
TASK NO. 13
OPERATING COST
CASE 2
PRIMARY HEAT EXCHANGER
70° F PROCESS GAS IN
WITH CATALYST
OPERATING COST - $/yr
240,000
220,000
200,000
180,000
160,000
140,000
120,000
100,000
80,000
60,000
40,000
20,000
0
0% LEL
5% LEL
13% LEL
25% LEL
0
5
10
15
20
25
30
FLOW ~ 10³ scfm
12/75


ENVIRONMENTAL PROTECTION AGENCY
CONTRACT NO. 68-02-1473
TASK NO. 13
OPERATING COSTS
CASE 2
PRIMARY HEAT EXCHANGER
300°F PROCESS GAS IN
WITH CATALYST
OPERATING COST ~ $/YR.
220,000
200,000
180,000
160,000
140,000
120,000
100,000
80,000
60,000
40,000
20,000
0
0%
5%
15%
NOTE: There is no 25% LEL line as operation at this level is not recommended.
0
5
10
15
20
25
30
FLOW ~ 10³ SCFM
12/75

Operating Cost Estimate

Unit Size 5000 SCFM 0 % LEL Process Temp. 70°F

Control Equipment Description

Thermal Incinerator - Case II Fume Incinerator With Heat Recovery - No Catalyst

Process Operating Time - 2 shifts/day - 365 days/yr = 5,840 hrs

Item	Description	Cost ($/yr)	
Utilities: Water, Steam, #2 Fuel Oil, Electricity,	$1.50/10⁶ BTU x 5.4 x 10⁶/hr x 5840 hrs	47304	
	$.03/KWH x 5840 hrs x .746 KW/HP x 11.7 HP.	1529	—
Direct Labor:	.5 hrs/shift x 730 shifts/yr x 8.00/hr	2920	—
Supplies:			
Maintenance, Building Overhead, Taxes & Insurance, Interest & Depreciation	Use 25% of capital costs .25 x $ 121,130	30282	—
	Total Operating Cost	82035	

Operating Cost Estimate

Unit Size 5000 SCFM 5 % LEL Process Temp. 70°F

Control Equipment Description

Thermal Incinerator - Case II Fume Incinerator With Heat Recovery - No Catalyst

Process Operating Time - 2 shifts/day - 365 days/yr = 5,840 hrs

Item	Description	Cost ($/yr)	
Utilities:			
Water, Steam, #2 Fuel Oil,	$1.50/10⁶ BTUX 4.5 x10⁶/hr x 5840 hrs	39420	
Electricity,	$.03/KWH x 5840 hrs x .746 KW/HP x 11.7 HP.	1529	—
Direct Labor:	.5 hrs/shift x 730 shifts/yr x 8.00/ hr.	2920	—
Supplies:			
Maintenance, Building Overhead, Taxes & Insurance, Interest & Depreciation	Use 25% of Capital Costs .25 x $ 121,130.	30,282	—
	Total Operating Cost	74,151	

Operating Cost Estimate

Unit Size 5000 SCFM 15 % LEL Process Temp. 70°F

Control Equipment Description

Thermal Incinerator - Case II Fume Incinerator With Heat Recovery - No Catalyst

Process Operating Time - 2 shifts/day - 365 days/yr = 5,840 hrs

Item	Description	Cost ($/yr)	
Utilities:			
Water,			
Steam,			
#2 Fuel Oil,	$1.50/10^6 BTU x 2.6 x 10^6/hr x 5840 hrs	22776	
Electricity,	$.03/KWH x 5840 hrs x .746 KW/HP x 11.7 HP.	1529	—
Direct Labor:	.5 hrs/shift x 730 shifts/yr x 8.00/hr	2920	—
Supplies:			
Maintenance Building Overhead Taxes & Insurance Interest & Depreciation	Use 25% of Capital Costs .25 x $ 121,130	30,282	—
	Total Operating Cost	57507	

Operating Cost Estimate

Unit Size 5000 SCFM 25 % LEL Process Temp. 70°F

Control Equipment Description

Thermal Incinerator - Case II Fume Incinerator With Heat Recovery - No Catalyst

Process Operating Time - 2 shifts/day - 365 days/yr = 5,840 hrs

Item	Description	Cost ($/yr)	
Utilities:			
Water,			
Steam,			
#2 Fuel Oil,	$1.50/10⁶ BTUX .7 x10⁶/hr x 5840 hrs	6132	
Electricity,	$.03/KWH x 5840 hrs x .746 KW/HP x 11.7 HP.	1529	
Direct Labor:	.5 hrs/shift x 730 shifts/yr x 8.00/ hr.	2920	—
Supplies:			
Maintenance Building Overhead Taxes & Insurance Interest & Depreciation	Use 25% of Capital Costs .25 x $ 121,130	30282	
	Total Operating Cost	40863	

Operating Cost Estimate

Unit Size 15000 SCFM 0 % LEL Process Temp. 70°

Control Equipment Description

Thermal Incinerator - Case II Fume Incinerator With Heat Recovery — No Catalyst

Process Operating Time - 2 shifts/day - 365 days/yr = 5,840 hrs

Item	Description	Cost ($/yr)	
Utilities:			
Water,			
Steam,			
#2 Fuel Oil,	$1.50/10⁶ BTU x 16.4 x 10⁶/hr x 5840 hrs	143664	
Electricity,	$.03/KWH x 5840 hrs x .746 KW/HP x 40.3 HP.	5267	
Direct Labor:	.5 hrs/shift x 730 shifts/yr x 8.00/hr	2920	—
Supplies:			
Maintenance	Use 25% of capital costs		
Building Overhead			
Taxes & Insurance	.25 x $ 151,440.	37,860	—
Interest & Depreciation			
	Total Operating Cost	189711	

Operating Cost Estimate

Unit Size 15000 SCFM 5 % LEL Process Temp. 70°

Control Equipment Description

Thermal Incinerator - Case II Fume Incinerator With Heat Recovery — No Catalyst

Process Operating Time - 2 shifts/day - 365 days/yr = 5,840 hrs

Item	Description	Cost ($/yr)	
Utilities:			
Water,			
Steam,			
#2 Fuel Oil,	$1.50/10⁶ BTU x 13.5 x10⁶/hr x 5840 hrs	118260	
Electricity,	$.03/KWH x 5840 hrs x .746 KW/HP x 40.3 HP.	5267	—
Direct Labor:	.5 hrs/shift x 730 shifts/yr x 8.00/ hr	2920	—
Supplies:			
Maintenance	Use 25% of capital costs		
Building Overhead			
Taxes & Insurance	.25 x $ 151,440	37,860	—
Interest & Depreciation			
	Total Operating Cost	164307	

Operating Cost Estimate

Unit Size 15000 SCFM 15 % LEL Process Temp. 70°

Control Equipment Description

Thermal Incinerator - Case II Fume Incinerator With Heat Recovery — No Catalyst

Process Operating Time - 2 shifts/day - 365 days/yr = 5,840 hrs

Item	Description	Cost ($/yr)	
Utilities:			
Water,			
Steam,			
#2 Fuel Oil,	$1.50/10⁶ BTU x 7.8 x10⁶/hr x 5840 hrs	68328	
Electricity,	$.03/KWH x 5840 hrs x .746 KW/HP x 40.3 HP.	5267	—
Direct Labor:	.5 hrs/shift x 730 shifts/yr x 8.00/ hr	2920	—
Supplies:			
Maintenance Building Overhead Taxes & Insurance Interest & Depreciation	Use 25% of capital costs .25 x $ 151,440	37,860	—
	Total Operating Cost	114375	

Operating Cost Estimate

Unit Size 15000 SCFM 25 % LEL Process Temp. 70°

Control Equipment Description

Thermal Incinerator - Case II Fume Incinerator With Heat Recovery — No Catalyst

Process Operating Time - 2 shifts/day - 365 days/yr = 5,840 hrs

Item	Description	Cost ($/yr)	
Utilities:			
Water,			
Steam,			
#2 Fuel Oil,	$1.50/10⁶ BTUx 2.1 x10⁶/hr x 5840 hrs	18396	
Electricity,	$.03/KWH x 5840 hrs x .746 KW/HP x 40.3 HP.	5267	—
Direct Labor:	.5 hrs/shift x 730 shifts/yr x 8.00/ hr	2920	—
Supplies:			
Maintenance Building Overhead Taxes & Insurance Interest & Depreciation	Use 25% of Capital Costs .25 x $ 151,440	37,860	—
	Total Operating Cost	64443	

Operating Cost Estimate

Unit Size 30,000 SCFM 0 % LEL Process Temp. 70°F

Control Equipment Description

Thermal Incinerator - Case II Fume Incinerator With Heat Recovery - No Catalyst

Process Operating Time - 2 shifts/day - 365 days/yr = 5,840 hrs

Item	Description	Cost ($/yr)	
Utilities:			
Water,			
Steam,			
#2 Fuel Oil,	$1.50/10⁶ BTU x 32.4 x 10⁶/hr x 5840 hrs	283824	
Electricity,	$.03/KWH x 5840 hrs x .746 KW/HP x 94.5 HP.	12351	
Direct Labor:	.5 hrs/shift x 730 shifts/yr x 8.00/hr	2920	—
Supplies:			
Maintenance	Use 25% of Capital Costs		
Building Overhead			
Taxes & Insurance	.25 x $ 193,050.	48,262	—
Interest & Depreciation			
	Total Operating Cost	347357	

Operating Cost Estimate

Unit Size 30,000 SCFM 5 % LEL Process Temp. 70°F

Control Equipment Description

Thermal Incinerator - Case II Fume Incinerator With Heat Recovery - No Catalyst

Process Operating Time - 2 shifts/day - 365 days/yr = 5,840 hrs

Item	Description	Cost ($/yr)	
Utilities:			
Water,			
Steam,			
#2 Fuel Oil,	$1.50/10⁶ BTU x 26.7 x 10⁶/hr x 5840 hrs	233892	
Electricity,	$.03/KWH x 5840 hrs x .746 KW/HP x 94.5 HP.	12351	—
Direct Labor:	.5 hrs/shift x 730 shifts/yr x 8.00/hr	2920	—
Supplies:			
Maintenance, Building Overhead, Taxes & Insurance, Interest & Depreciation	Use 25% of capital costs .25 x $ 193,050	48,262	—
	Total Operating Cost	297425	

Operating Cost Estimate

Unit Size 30,000 SCFM 15 % LEL Process Temp. 70°F

Control Equipment Description

Thermal Incinerator - Case II Fume Incinerator With Heat Recovery - No Catalyst

Process Operating Time - 2 shifts/day - 365 days/yr = 5,840 hrs

Item	Description	Cost ($/yr)	
Utilities:			
Water,			
Steam,			
#2 Fuel Oil,	$1.50/10⁶ BTU x 15.5 x 10⁶/hr x 5840 hrs	135780	
Electricity,	$.03/KWH x 5840 hrs x .746 KW/HP x 94.5 HP.	12,351	—
Direct Labor:	.5 hrs/shift x 730 shifts/yr x 8.00/hr	2920	—
Supplies:			
Maintenance	Use 25% of capital costs		
Building Overhead			
Taxes & Insurance	.25 x $ 193,050	48,262	—
Interest & Depreciation			
	Total Operating Cost	199313	

Operating Cost Estimate

Unit Size 30,000 SCFM 25 % LEL Process Temp. 70°F

Control Equipment Description

Thermal Incinerator - Case II Fume Incinerator With Heat Recovery - No Catalyst

Process Operating Time - 2 shifts/day - 365 days/yr = 5,840 hrs

Item	Description	Cost ($/yr)	
Utilities: Water, Steam, #2 Fuel Oil,	$1.50/10⁶ BTU x 4.2 x10⁶/hr x 5840 hrs	36,792	—
Electricity,	$.03/KWH x 5840 hrs x .746 KW/HP x 94.5 HP.	12,351	—
Direct Labor:	.5 hrs/shift x 730 shifts/yr x 8.00/ hr	2920	—
Supplies:			
Maintenance, Building Overhead, Taxes & Insurance, Interest & Depreciation	Use 25% of capital costs .25 x $ 193,050	48,262	—
	Total Operating Cost	100,325	

Operating Cost Estimate

Unit Size 5000 SCFM 0 % LEL Process Temp. 300°F

Control Equipment Description

Thermal Incinerator - Case II Fume Incinerator With Heat Recovery. — No Catalyst

Process Operating Time - 2 shifts/day - 365 days/yr = 5,840 hrs

Item	Description	Cost ($/yr)	
Utilities:			
Water,			
Steam,			
#2 Fuel Oil,	$1.50/10⁶ BTU x 4.5 x 10⁶/hr x 5840 hrs	39420	
Electricity,	$.03/KWH x 5840 hrs x .746 KW/HP x 24.7 HP.	3228	—
Direct Labor:	.5 hrs/shift x 730 shifts/yr x 8.00/hr	2920	—
Supplies:			
Maintenance	Use 25% of capital costs		
Building Overhead	.25 x $ 121,130.	30,282	—
Taxes & Insurance			
Interest & Depreciation			
	Total Operating Cost	75850	

Operating Cost Estimate

Unit Size 5000 SCFM 5 % LEL Process Temp. 300°F

Control Equipment Description

Thermal Incinerator - Case II Fume Incinerator With Heat Recovery. — NO CATALYST

Process Operating Time - 2 shifts/day - 365 days/yr = 5,840 hrs

Item	Description	Cost ($/yr)	
Utilities: Water, Steam, #2 Fuel Oil,	$1.50/10⁶ BTUX 3.5 x10⁶/hr x 5840 hrs	30660	
Electricity,	$.03/KWH x 5840 hrs x .746 KW/HP x 24.7 HP.	3228	
Direct Labor:	.5 hrs/shift x 730 shifts/yr x 8.00/ hr	2920	—
Supplies:			
Maintenance, Building Overhead, Taxes & Insurance, Interest & Depreciation	Use 25% of Capital Costs .25 x $ 121,130	30282	—
	Total Operating Cost	67090	

Operating Cost Estimate

Unit Size 5000 SCFM 15% LEL Process Temp. 300°F

Control Equipment Description

Thermal Incinerator - Case IL Fume Incinerator With Heat Recovery. — NO CATALYST

Process Operating Time - 2 shifts/day - 365 days/yr = 5,840 hrs

Item	Description	Cost ($/yr)	
Utilities:			
Water,			
Steam,			
#2 Fuel Oil,	$1.50/10⁶ BTUx 1.7 x10⁶/hr x 5840 hrs	14892	
Electricity,	$.03/KWH x 5840 hrs x .746 KW/HP x 24.7 HP.	3228	
Direct Labor:	.5 hrs/shift x 730 shifts/yr x 8.00/hr	2920	—
Supplies:			
Maintenance, Building Overhead, Taxes & Insurance, Interest & Depreciation	use 25% of capital costs .25 x $ 121,130	30,282	—
	Total Operating Cost	51322	

Operating Cost Estimate

Unit Size 5000 SCFM 25 % LEL Process Temp. 300°F

Control Equipment Description

Thermal Incinerator - Case II Fume Incinerator With Heat Recovery. — No Catalyst

Process Operating Time - 2 shifts/day - 365 days/yr = 5,840 hrs

Item	Description	Cost ($/yr)	
Utilities:			
Water,			
Steam,			
#2 Fuel Oil,	$1.50/10⁶ BTU x .045 x 10⁶/hr x 5840 hrs	3942	
Electricity,	$.03/KWH x 5840 hrs x .746 KW/HP x 24.7 HP.	3228	
Direct Labor:	.5 hrs/shift x 730 shifts/yr x 8.00/hr	2920	—
Supplies:			
Maintenance, Building Overhead, Taxes & Insurance, Interest & Depreciation	Use 25% of capital costs .25 x $ 127,130	31783	—
	Total Operating Cost	41,873	

Operating Cost Estimate

Unit Size 15,000 SCFM 0 % LEL Process Temp. 300°F

Control Equipment Description

Thermal Incinerator - Case II Fume Incinerator With Heat Recovery - No Catalyst

Process Operating Time - 2 shifts/day - 365 days/yr = 5,840 hrs

Item	Description	Cost ($/yr)	
Utilities:			
Water,			
Steam,			
#2 Fuel Oil,	$1.50/10⁶ BTU x 13.6 x 10⁶/hr x 5840 hrs	119136	
Electricity,	$.03/KWH x 5840 hrs x .746 KW/HP x 82.2 HP.	10743	
Direct Labor:	.5 hrs/shift x 730 shifts/yr x 8.00/hr	2920	—
Supplies:			
Maintenance	Use 25% of Capital Costs		
Building Overhead			
Taxes & Insurance	.25 x $ 151,440	37,860	—
Interest & Depreciation			
	Total Operating Cost	170659	

Operating Cost Estimate

Unit Size 15,000 SCFM 5 % LEL Process Temp. 300°F

Control Equipment Description

Thermal Incinerator - Case II Fume Incinerator With Heat Recovery - No Catalyst

Process Operating Time - 2 Shifts/Day - 365 Days/Yr = 5,840 Hrs

Item	Description	Cost ($/Yr)	
Utilities:			
Water,			
Steam,			
#2 Fuel Oil,	$1.50/10⁶ BTU x 10.7 x 10⁶/Hr x 5840 Hrs	93732	
Electricity,	$.03/KWH x 5840 Hrs x .746 KW/HP x 82.2 HP.	10743	
Direct Labor:	.5 Hrs/Shift x 730 Shifts/Yr x 8.00/Hr	2920	—
Supplies:			
Maintenance	Use 25% of Capital Costs		
Building Overhead			
Taxes & Insurance	.25 x $ 151,440	37,860	—
Interest & Depreciation			
	Total Operating Cost	145,255	

Operating Cost Estimate

Unit Size 15,000 SCFM 15 % LEL Process Temp. 300°F

Control Equipment Description

Thermal Incinerator - Case II Fume Incinerator With Heat Recovery - No Catalyst

Process Operating Time - 2 shifts/day - 365 days/yr = 5,840 hrs

Item	Description	Cost ($/yr)	
Utilities:			
Water,			
Steam,			
#2 Fuel Oil,	$1.50/$10^6$ BTU x 5.0 x 10^6/hr x 5840 hrs	43800	
Electricity,	$.03/KWH x 5840 hrs x .746 KW/HP x 82.2 HP.	10743	—
Direct Labor:	.5 hrs/shift x 730 shifts/yr x 8.00/hr	2920	—
Supplies:			
Maintenance	Use 25% of Capital Costs		
Building Overhead			
Taxes & Insurance	.25 x $ 151,440	37,860	—
Interest & Depreciation			
	Total Operating Cost	95,323	

Operating Cost Estimate

Unit Size 15,000 SCFM 25 % LEL Process Temp. 300°F

Control Equipment Description

Thermal Incinerator - Case II Fume Incinerator With Heat Recovery - No Catalyst

Process Operating Time - 2 shifts/day - 365 days/yr = 5,840 hrs

Item	Description	Cost ($/yr)	
Utilities:			
Water,			
Steam,			
#2 Fuel Oil,	$1.50/10⁶ BTU x 1.4 x 10⁶/hr x 5840 hrs	12,264	
Electricity,	$.03/KWH x 5840 hrs x .746 KW/HP x 82.2 HP.	10743	—
Direct Labor:	.5 hrs/shift x 730 shifts/yr x 8.00/hr	2920	—
Supplies:			
Maintenance	Use 25% of capital costs		
Building Overhead			
Taxes & Insurance	.25 x $ 158,940	39,735	—
Interest & Depreciation			
	Total Operating Cost	65,662	

Operating Cost Estimate

Unit Size 30,000 SCFM 0% LEL Process Temp. 300°F

Control Equipment Description

Thermal Incinerator - Case II Fume Incinerator With Heat Recovery - No Catalyst

Process Operating Time - 2 shifts/day - 365 days/yr = 5,840 hrs

Item	Description	Cost ($/yr)	
Utilities:			
Water,			
Steam,			
#2 Fuel Oil,	$1.50/10⁶ BTU x 26.9 x 10⁶/hr x 5840 hrs	235,644	—
Electricity,	$.03/KWH x 5840 hrs x .746 KW/HP x 140.9 HP.	18,416	—
Direct Labor:	.5 hrs/shift x 730 shifts/yr x 8.00/hr	2920	—
Supplies:			
Maintenance	Use 25% of capital costs		
Building Overhead			
Taxes & Insurance	.25 x $ 193,050.	48262	
Interest & Depreciation			
	Total Operating Cost	305,242	

Operating Cost Estimate

Unit Size 30,000 SCFM 5% LEL Process Temp. 300°F

Control Equipment Description

Thermal Incinerator - Case II Fume Incinerator With Heat Recovery - No Catalyst

Process Operating Time - 2 shifts/day - 365 days/yr = 5,840 hrs

Item	Description	Cost ($/yr)	
Utilities:			
Water,			
Steam,			
#2 Fuel Oil,	$1.50/10⁶ BTU x 21.3 x 10⁶/hr x 5840 hrs	186,588	—
Electricity,	$.03/KWH x 5840 hrs x .746 KW/HP x 140 HP.	18,416	—
Direct Labor:	.5 hrs/shift x 730 shifts/yr x 8.00/hr	2920	—
Supplies:			
Maintenance	Use 25% of Capital Costs		
Building Overhead			
Taxes & Insurance	.25 x $ 193,050.	48,262	—
Interest & Depreciation			
	Total Operating Cost	256,186	

Operating Cost Estimate

Unit Size 30,000 SCFM 15 % LEL Process Temp. 300°F

Control Equipment Description

Thermal Incinerator - Case II Fume Incinerator With Heat Recovery - No Catalyst

Process Operating Time - 2 shifts/day - 365 days/yr = 5,840 hrs

Item	Description	Cost ($/yr)	
Utilities:			
Water,			
Steam,			
#2 Fuel Oil,	$1.50/10⁶ BTU x 10.0 x 10⁶/hr x 5840 hrs	87,600	—
Electricity,	$.03/KWH x 5840 hrs x .746 KW/HP x 140.9 HP.	18,416	—
Direct Labor:	.5 hrs/shift x 730 shifts/yr x 8.00/hr.	2920	—
Supplies:			
Maintenance	Use 25% of capital costs		
Building Overhead			
Taxes & Insurance	.25 x $ 193,050	48,262	—
Interest & Depreciation			
	Total Operating Cost	157,198	

Operating Cost Estimate

Unit Size 30,000 SCFM 25 % LEL Process Temp. 300°F

Control Equipment Description

Thermal Incinerator - Case II Fume Incinerator With Heat Recovery - No Catalyst

Process Operating Time - 2 shifts/day - 365 days/yr = 5,840 hrs

Item	Description	Cost ($/yr)	
Utilities:			
Water,			
Steam,			
#2 Fuel Oil,	$1.50/10^6 BTU x 2.7 x 10^6/hr x 5840 hrs	23652	—
Electricity,	$.03/KWH x 5840 hrs x .746 KW/HP x 140.9 HP.	18,416	
Direct Labor:	.5 hrs/shift x 730 shifts/yr x 8.00/hr.	2920	—
Supplies:			
Maintenance, Building Overhead, Taxes & Insurance, Interest & Depreciation	Use 25% of capital costs .25 x $ 201,550	50,388	—
	Total Operating Cost	95,376	

Operating Cost Estimate

Unit Size 5,000 SCFM 0 % LEL Process Temp. 70°F

Control Equipment Description

Thermal Incinerator - Case II Fume Incinerator With Heat Recovery & Catalyst

Process Operating Time - 2 shifts/day - 365 days/yr = 5,840 hrs

Item	Description	Cost ($/yr)	
Utilities:			
Water,			
Steam,			
#2 Fuel Oil,	$1.50/10⁶ BTU x 2.0 x 10⁶/hr x 5840 hrs	17520	
Electricity,	$.03/KWH x 5840 hrs x .746 KW/HP x 12.9 HP.	16.86	—
Replace Catalyst,	0.4141 x $14,500. (3 yrs life)	6005	—
Direct Labor:	.5 hrs/shift x 730 shifts/yr x 8.00/hr	2920	—
Supplies:			
Maintenance	Use 25% of capital costs		
Building Overhead			
Taxes & Insurance	.25 x $ 92,910	23,227	—
Interest & Depreciation			
	Total Operating Cost	51,358	

Operating Cost Estimate

Unit Size 5,000 SCFM 5 % LEL Process Temp. 70°F

Control Equipment Description

Thermal Incinerator - Case II Fume Incinerator With Heat Recovery & Catalyst

Process Operating Time - 2 shifts/day - 365 days/yr = 5,840 hrs

Item	Description	Cost ($/yr)	
Utilities:			
Water,			
Steam,			
#2 Fuel Oil,	$1.50/10⁶ BTU x 1.7 x10⁶/hr x 5840 hrs	14892	
Electricity,	$.03/KWH x 5840 hrs x .746 KW/HP x 12.9 HP.	1686	—
Replace Catalyst,	0.4141 x $14,500. (3 yrs life)	6005	—
Direct Labor:	.5 hrs/shift x 730 shifts/yr x 8.00/hr	2920	—
Supplies:			
Maintenance Building Overhead Taxes & Insurance Interest & Depreciation	Use 25% of Capital Costs .25 x $ 92,910.	23,227	—
	Total Operating Cost	48,730	

Operating Cost Estimate

Unit Size 5,000 SCFM 15 % LEL Process Temp. 70°F

Control Equipment Description

Thermal Incinerator - Case II Fume Incinerator With Heat Recovery & Catalyst

Process Operating Time - 2 shifts/day - 365 days/yr = 5,840 hrs

Item	Description	Cost ($/yr)	
Utilities:			
Water,			
Steam,			
#2 Fuel Oil,	$1.50/10⁶ BTU x 1.2 x 10⁶/hr x 5840 hrs	10512	
Electricity,	$.03/KWH x 5840 hrs x .746 KW/HP x 12.9 HP.	1686	—
Replace Catalyst,	0.4141 x $14,500. (3 yrs life)	6005	—
Direct Labor:	.5 hrs/shift x 730 shifts/yr x 8.00/hr	2920	—
Supplies:			
Maintenance Building Overhead Taxes & Insurance Interest & Depreciation	Use 25% of capital costs .25 x $ 121,740.	30,435	—
	Total Operating Cost	51,558	

Operating Cost Estimate

Unit Size 5,000 SCFM 25 % LEL Process Temp. 70°F

Control Equipment Description

Thermal Incinerator - Case II Fume Incinerator With Heat Recovery & Catalyst

Process Operating Time - 2 shifts/day - 365 days/yr = 5,840 hrs

Item	Description	Cost ($/yr)	
Utilities:			
Water,			
Steam,			
#2 Fuel Oil,	$1.50/10⁶ BTU x 0.2 x 10⁶/hr x 5840 hrs	1752	
Electricity,	$.03/KWH x 5840 hrs x .746 KW/HP x 14.0 HP.	1830	
Replace Catalyst,	0.4141 x $14,500. (3 yrs life)	6005	—
Direct Labor:	.5 hrs/shift x 730 shifts/yr x 8.00/hr	2920	—
Supplies:			
Maintenance Building Overhead Taxes & Insurance Interest & Depreciation	Use 25% of capital costs .25 x $ 121,740	30,435	—
	Total Operating Cost	42,942	—

Operating Cost Estimate

Unit Size 15,000 SCFM 0 % LEL Process Temp. 70°F

Control Equipment Description

Thermal Incinerator - Case II Fume Incinerator with Heat Recovery & Catalyst

Process Operating Time - 2 shifts/day - 365 days/yr = 5,840 hrs

Item	Description	Cost ($/yr)	
Utilities:			
Water,			
Steam,			
#2 Fuel Oil,	$1.50/10⁶ BTU x 6.1 x10⁶/hr x 5840 hrs	53436	
Electricity,	$.03/KWH x 5840 hrs x .746 KW/HP x 40.3 HP.	5267	—
Replace Catalyst,	0.4141 x $43500. (3 yrs life)	18014	—
Direct Labor:	.5 hrs/shift x 730 shifts/yr x 8.00/hr	2920	—
Supplies:			
Maintenance, Building Overhead, Taxes & Insurance, Interest & Depreciation	Use 25% of capital costs .25 x $157,280	39,320	—
	Total Operating Cost	118,957	

Operating Cost Estimate

Unit Size 15,000 SCFM 5% LEL Process Temp. 70°F

Control Equipment Description

Thermal Incinerator - Case II Fume Incinerator With Heat Recovery & Catalyst

Process Operating Time - 2 shifts/day - 365 days/yr = 5,840 hrs

Item	Description	Cost ($/yr)	
Utilities:			
Water,			
Steam,			
#2 Fuel Oil,	$1.50/10⁶ BTUX 5.0 x10⁶/HR x 5840 HRS	43800	
Electricity,	$.03/KWH x 5840 HRS x .746 KW/HP x 40.3 HP.	5267	—
Replace Catalyst,	0.4141 x $43,500. (3 yrs life)	18014	—
Direct Labor:	.5 HRS/shift x 730 shifts/yr x 8.00/HR	2920	—
Supplies:			
Maintenance Building Overhead Taxes & Insurance Interest & Depreciation	Use 25% of capital costs .25 x $157,280	39,320	—
	Total Operating Cost	109,321	

Operating Cost Estimate

Unit Size 15,000 SCFM 15 % LEL Process Temp. 70°F

Control Equipment Description

Thermal Incinerator - Case II Fume Incinerator With Heat Recovery & Catalyst

Process Operating Time - 2 shifts/day - 365 days/yr = 5,840 hrs

Item	Description	Cost ($/yr)	
Utilities:			
Water,			
Steam,			
#2 Fuel Oil,	$1.50/10⁶ BTU x 3.5 x 10⁶/hr x 5840 hrs	30660	
Electricity,	$.03/KWH x 5840 hrs x .746 KW/HP x 40.3 HP.	5267	—
Replace Catalyst,	.04141 x $43,500. (3 yrs life)	18014	—
Direct Labor:	.5 hrs/shift x 730 shifts/yr x 8.00/hr	2920	—
Supplies:			
Maintenance	Use 25% of capital costs		
Building Overhead			
Taxes & Insurance	.25 x $189,370.	47,342	—
Intrest & Depreciation			
	Total Operating Cost	104,203	—

Operating Cost Estimate

Unit Size 15,000 SCFM 25 % LEL Process Temp. 70°F

Control Equipment Description

Thermal Incinerator - Case II Fume Incinerator With Heat Recovery & Catalyst

Process Operating Time - 2 shifts/day - 365 days/yr = 5,840 hrs

Item	Description	Cost ($/yr)	
Utilities:			
Water,			
Steam,			
#2 Fuel Oil,	$1.50/10⁶ BTU x 0.61 x 10⁶/hr x 5840 hrs	5344	
Electricity,	$.03/KWH x 5840 hrs x .746 KW/HP x 40.3 HP.	5267	
Replace Catalyst,	0.4141 x $43,500. (3 yrs life)	18014	—
Direct Labor:	.5 hrs/shift x 730 shifts/yr x 8.00/hr	2920	—
Supplies:			
Maintenance	Use 25% of capital costs		
Building Overhead			
Taxes & Insurance	.25 x $189,370	47,342	—
Interest & Depreciation			
	Total Operating Cost	78,887	

Operating Cost Estimate

Unit Size 30000 SCFM 0 % LEL Process Temp. 70°F

Control Equipment Description

Thermal Incinerator - Case II Fume Incinerator with Heat Recovery + Catalyst

Process Operating Time - 2 shifts/day - 365 days/yr = 5,840 hrs

Item	Description	Cost ($/yr)	
Utilities:			
Water,			
Steam,			
#2 Fuel Oil,	$1.50/10⁶ BTUX 12.2 x10⁶/hr x 5840 hrs	106872	
Electricity,	$.03/KWH x 5840 hrs x .746 KW/HP x 99.4 HP.	12992	—
Replace Catalyst,	.0.4141 x $ 89,000. (3 yrs life)	36,027	—
Direct Labor:	.5 hrs/shift x 730 shifts/yr x 8.00/hr	2920	—
Supplies:			
Maintenance	Use 25% of Capital Costs		
Building Overhead			
Taxes & Insurance	.25 x $ 241,505	60,376	—
Interest & Depreciation			
	Total Operating Cost	219,187	—

Operating Cost Estimate

Unit Size 30,000 SCFM 5 % LEL Process Temp. 70°F

Control Equipment Description

Thermal Incinerator - Case II Fume Incinerator with Heat Recovery + Catalyst

Process Operating Time - 2 shifts/day - 365 days/yr = 5,840 hrs

Item	Description	Cost ($/yr)	
Utilities:			
Water,			
Steam,			
#2 Fuel Oil,	$1.50/10⁶ BTU x 10.4 x10⁶/hr x 5840 hrs	91104	
Electricity,	$.03/KWH x 5840 hrs x .746 KW/HP x 99.4 HP.	12992	—
Replace Catalyst,	.0.4141 x $ 89000. (3 yrs life)	36,027	—
Direct Labor:	.5 hrs/shift x 730 shifts/yr x 8.00/hr	2920	—
Supplies:			
Maintenance	Use 25% of capital costs		
Building Overhead			
Taxes & Insurance	.25 x $ 241,505	60,376	—
Interest & Depreciation			
	Total Operating Cost	203,419	

Operating Cost Estimate

Unit Size 30000 SCFM 15 % LEL Process Temp. 70°F

Control Equipment Description

Thermal Incinerator - Case II Fume Incinerator with Heat Recovery + Catalyst

Process Operating Time - 2 shifts/day - 365 days/yr = 5,840 hrs

Item	Description	Cost ($/yr)	
Utilities:			
Water,			
Steam,			
#2 Fuel Oil,	$1.50/10^6 BTU x 7.1 x 10^6/hr x 5840 hrs	62196	
Electricity,	$.03/KWH x 5840 hrs x .746 KW/HP x 99.4 HP.	12992	—
Replace Catalyst,	.0.4141 x $ 89000. (3 yrs life)	36,027	—
Direct Labor:	.5 hrs/shift x 730 shifts/yr x 8.00/hr	2920	—
Supplies:			
Maintenance	Use 25% of capital costs		
Building Overhead			
Taxes & Insurance	.25 x $ 275,125	68,781	—
Interest & Depreciation			
	Total Operating Cost	182,916	—

Operating Cost Estimate

Unit Size 30000 SCFM 25 % LEL Process Temp. 70°F

Control Equipment Description

Thermal Incinerator - Case II Fume Incinerator With Heat Recovery + Catalyst

Process Operating Time - 2 shifts/day - 365 days/yr = 5,840 hrs

Item	Description	Cost ($/yr)	
Utilities:			
Water,			
Steam,			
#2 Fuel Oil,	$1.50/10⁶ BTU x 422 x 10⁶/hr x 5840 hrs	10,682	
Electricity,	$.03/KWH x 5840 hrs x .746 KW/HP x 1056 HP.	13802	—
Replace Catalyst,	.0.4141 x # 89000. (3 yrs life)	36,027	—
Direct Labor:	.5 hrs/shift x 730 shifts/yr x 8.00/hr	2920	—
Supplies:			
Maintenance Building Overhead Taxes & Insurance Interest & Depreciation	Use 25% of capital costs .25 x # 275,125	68,781	—
	Total Operating Cost	132,217	

Operating Cost Estimate

Unit Size 5,000 SCFM 0 % LEL Process Temp. 300°F

Control Equipment Description

Thermal Incinerator - Case II Fume Incinerator

With Heat Recovery & Catalyst

Process Operating Time - 2 shifts/day - 365 days/yr = 5,840 hrs

Item	Description	Cost ($/yr)	
Utilities:			
Water,			
Steam,			
#2 Fuel Oil,	$1.50/10⁶ BTUX 1.2 x10⁶/hr x 5840 hrs	10512	
Electricity,	$.03/KWH x 5840 hrs x .746 KW/HP x 26.9 HP.	3516	—
Replace Catalyst,	0.4141 x $14,500. (3 yrs life)	6005	—
Direct Labor:	.5 hrs/shift x 730 shifts/yr x 8.00/hr	2920	—
Supplies:			
Maintenance	use 25% of capital costs		
Building Overhead			
Taxes & Insurance	.25 x $ 92,910	23227	—
Interest & Depreciation			
	Total Operating Cost	46,180	

Operating Cost Estimate

Unit Size 5,000 SCFM 5 % LEL Process Temp. 300°F

Control Equipment Description

Thermal Incinerator - Case II Fume Incinerator With Heat Recovery & Catalyst

Process Operating Time - 2 shifts/day - 365 days/yr = 5,840 hrs

Item	Description	Cost ($/yr)	
Utilities:			
Water,			
Steam,			
#2 Fuel Oil,	$1.50/10⁶ BTUx .8 x10⁶/hr x 5840 hrs	7008	
Electricity,	$.03/KWH x 5840 hrs x .746 KW/HP x 26.9 HP.	3516	—
Replace Catalyst,	0.4141 x $14,500. (3 yrs life)	6005	—
Direct Labor:	.5 hrs/shift x 730 shifts/yr x 8.00/hr	2920	—
Supplies:			
Maintenance	Use 25% of capital costs		
Building Overhead			
Taxes & Insurance	.25 x $ 92,910	23227	—
Interest & Depreciation			
	Total Operating Cost	42676	

Operating Cost Estimate

Unit Size 5,000 SCFM 15 % LEL Process Temp. 300°F

Control Equipment Description

Thermal Incinerator - Case II Fume Incinerator With Heat Recovery & Catalyst

Process Operating Time - 2 shifts/day - 365 days/yr = 5,840 hrs

Item	Description	Cost ($/yr)	
Utilities:			
Water,			
Steam,			
#2 Fuel Oil,	$1.50/10⁶ BTU x .3 x 10⁶/hr x 5840 hrs	2628	
Electricity,	$.03/KWH x 5840 hrs x .746 KW/HP x 26.9 HP.	3516	—
Replace Catalyst,	0.4141 x $14,500. (3 yrs life)	6005	—
Direct Labor:	.5 hrs/shift x 730 shifts/yr x 8.00/hr	2920	—
Supplies:			
Maintenance	Use 25% of capital costs		
Building Overhead			
Taxes & Insurance	.25 x $121,740	30,435	—
Interest & Depreciation			
	Total Operating Cost	45,504	

OPERATING COST ESTIMATE

UNIT SIZE 5,000 SCFM 25 % LEL PROCESS TEMP. 300°F

CONTROL EQUIPTMENT DESCRIPTION

THERMAL INCINERATOR - CASE II FUME INCINERATOR WITH HEAT RECOVERY & CATALYST

PROCESS OPERATING TIME - 2 SHIFTS/DAY - 365 DAYS/YR = 5,840 HRS

ITEM	DESCRIPTION	COST ($/YR)	
UTILITIES:			
WATER,			
STEAM,			
#2 FUEL OIL,	$1.50/10⁶ BTU x xx x 10⁶/HR 5P HRS		
ELECTRICITY,	$.03/KWH x 5840 HRS x K x 28.6 HP.	3738	—
REPLACE CATALYST,	0.4141 x $14,500. YR FE)	6005	—
DIRECT LABOR:	.5 HRS/SHIFT S/YR x 8.00/HR	2920	—
SUPPLIES:			
MAINTENANCE			
BUILDING OVERHEAD	25% OF CAPITAL COSTS		
TAXES & INSURANCE	.25 x $ 121,740	30,435	—
INTREST & DEPRECIATION			
	TOTAL OPERATING COST		

OPERATION AT ABOVE DESIGN CONDITIONS NOT RECOMMENDED

OPERATION AT ABOVE DESIGN CONDITIONS NOT RECOMMENDED

Operating Cost Estimate

Unit Size 15,000 SCFM 0 % LEL Process Temp. 300°F

Control Equipment Description

Thermal Incinerator - Case II Fume Incinerator With Heat Recovery & Catalyst

Process Operating Time - 2 Shifts/Day - 365 Days/Yr = 5,840 Hrs

Item	Description	Cost ($/Yr)	
Utilities:			
Water,			
Steam,			
#2 Fuel Oil,	$1.50/10⁶ BTUx 3.6 x10⁶/Hr x 5840 Hrs	31536	
Electricity,	$.03/KWH x 5840 Hrs x .746 KW/HP x 85.7 HP.	11201	—
Replace Catalyst,	0.4141 x # 43500. (3 Yrs Life)	18014	—
Direct Labor:	.5 Hrs/Shift x 730 Shifts/Yr x 8.00/Hr	2920	—
Supplies:			
Maintenance, Building Overhead, Taxes & Insurance, Interest & Depreciation	Use 25% of Capital Costs .25 x # 157,280.	39320	—
	Total Operating Cost	102,991	

Operating Cost Estimate

Unit Size 15,000 SCFM 5 % LEL Process Temp. 300°F

Control Equipment Description

Thermal Incinerator - Case II Fume Incinerator With Heat Recovery & Catalyst

Process Operating Time - 2 shifts/day - 365 days/yr = 5,840 hrs

Item	Description	Cost ($/yr)	
Utilities:			
Water,			
Steam,			
#2 Fuel Oil,	$1.50/10⁶ BTU x 2.5 x 10⁶/hr x 5840 hrs	21900	
Electricity,	$.03/KWH x 5840 hrs x .746 KW/HP x 85.7 HP.	11201	—
Replace Catalyst,	.04141 x $43,500. (3 yrs life)	18014	—
Direct Labor:	.5 hrs/shift x 730 shifts/yr x 8.00/hr	2920	—
Supplies:			
Maintenance	Use 25% of capital costs		
Building Overhead			
Taxes & Insurance	.25 x $157,280	39,320	—
Interest & Depreciation			
	Total Operating Cost	93355	

Operating Cost Estimate

Unit Size 15,000 SCFM 15% LEL Process Temp. 300°F

Control Equipment Description

Thermal Incinerator - Case II Fume Incinerator With Heat Recovery & Catalyst

Process Operating Time - 2 shifts/day - 365 days/yr = 5,840 hrs

Item	Description	Cost ($/yr)	
Utilities:			
Water,			
Steam,			
#2 Fuel Oil,	$1.50/10⁶ BTU x 0.8 x 10⁶/hr x 5840 hrs	7008	
Electricity,	$.03/KWH x 5840 hrs x .746 KW/HP x 85.7 HP.	11201	—
Replace Catalyst,	.04141 x $43,500. (3 yrs life)	18014	—
Direct Labor:	.5 hrs/shift x 730 shifts/yr x 8.00/hr	2920	—
Supplies:			
Maintenance, Building Overhead, Taxes & Insurance, Interest & Depreciation	Use 25% of capital costs .25 x $189,370	47,342	—
	Total Operating Cost	86485	

Operating Cost Estimate

Unit Size 15,000 SCFM 25 % LEL Process Temp. 300°F

Control Equipment Description

Thermal Incinerator - Case II Fume Incinerator With Heat Recovery & Catalyst

Process Operating Time - 2 shifts/day - 365 days/yr = 5,840 hrs

Item	Description	Cost ($/yr)	
Utilities:			
Water,			
Steam,			
#2 Fuel Oil,	$1.50/10⁶ BTU x 0 x 10⁶/hr 8 hrs		
Electricity,	$.03/KWH x 5840 hrs x .7 x .93.7 HP.	12247	—
Replace Catalyst,	0.4141 x $43,500. (2 yr)	18014	—
Direct Labor:	.5 hrs/shift x 2 shifts/day x 365 days/yr x 8.00/hr	2920	—
Supplies:			
Maintenance	5% of capital costs		
Building Overhead			
Taxes & Insurance	5 x $ 189,370	47,342	—
Interest & Depreciation			
	Operation at above design conditions not recommended		
	Operation at above design conditions not recommended		
	Total operating cost		

Operating Cost Estimate

Unit Size 30,000 SCFM 0 % LEL Process Temp. 300°F

Control Equipment Description

Thermal Incinerator - Case II Fume Incinerator With Heat Recovery + Catalyst

Process Operating Time - 2 Shifts/Day - 365 Days/Yr = 5,840 Hrs

Item	Description	Cost ($/Yr)	
Utilities:			
Water,			
Steam,			
#2 Fuel Oil,	$1.50/10⁶ BTU x 7.2 x 10⁶/Hr x 5840 Hrs	63072	
Electricity,	$.03/KWH x 5840 Hrs x .746 KW/HP x 218.0 HP.	28492	—
Replace Catalyst,	.0.4141 x # 89000. (3 yrs life)	36,027	—
Direct Labor:	.5 Hrs/Shift x 730 Shifts/Yr x 8.00/Hr	2920	—
Supplies:			
Maintenance	Use 25% of Capital Costs		
Building Overhead			
Taxes & Insurance	.25 x $ 241,505	60,376	—
Interest & Depreciation			
	Total Operating Cost	190,887	

Operating Cost Estimate

Unit Size 30,000 SCFM 5 % LEL Process Temp. 300°F

Control Equipment Description

Thermal Incinerator - Case II Fume Incinerator with Heat Recovery + Catalyst

Process Operating Time - 2 shifts/day - 365 days/yr = 5,840 hrs

Item	Description	Cost ($/yr)	
Utilities:			
Water,			
Steam,			
#2 Fuel Oil,	$1.50/10⁶ BTU x 5.1 x 10⁶/hr x 5840 hrs	44676	
Electricity,	$.03/KWH x 5840 hrs x .746 KW/HP x 218.0 HP.	28492	—
Replace Catalyst,	.0.4141 x $ 89000. (3 yrs life)	36,027	—
Direct Labor:	.5 hrs/shift x 730 shifts/yr x 8.00/hr	2920	—
Supplies:			
Maintenance	Use 25% of capital costs		
Building Overhead			
Taxes & Insurance	.25 x $ 241,505	60,376	—
Interest & Depreciation			
	Total Operating Cost	172,491	—

Operating Cost Estimate

Unit Size 30,000 SCFM 15 % LEL Process Temp. 300°F

Control Equipment Description

Thermal Incinerator - Case II Fume Incinerator With Heat Recovery + Catalyst

Process Operating Time - 2 shifts/day - 365 days/yr = 5,840 hrs

Item	Description	Cost ($/yr)	
Utilities:			
Water,			
Steam,			
#2 Fuel Oil,	$1.50/10⁶ BTU x 1.7 x 10⁶/hr x 5840 hrs	14892	
Electricity,	$.03/KWH x 5840 hrs x .746 KW/HP x 218.0 HP.	28492	—
Replace Catalyst,	.0.4141 x $ 89000. (3 yrs life)	36,027	—
Direct Labor:	.5 hrs/shift x 730 shifts/yr x 8.00/hr	2920	—
Supplies:			
Maintenance Building Overhead Taxes & Insurance Interest & Depreciation	Use 25% of capital costs .25 x $ 275,125.	68,781	—
	Total Operating Cost	151,112	

OPERATING COST ESTIMATE

UNIT SIZE 30,000 SCFM 25% LEL PROCESS TEMP. 300°F

CONTROL EQUIPTMENT DESCRIPTION

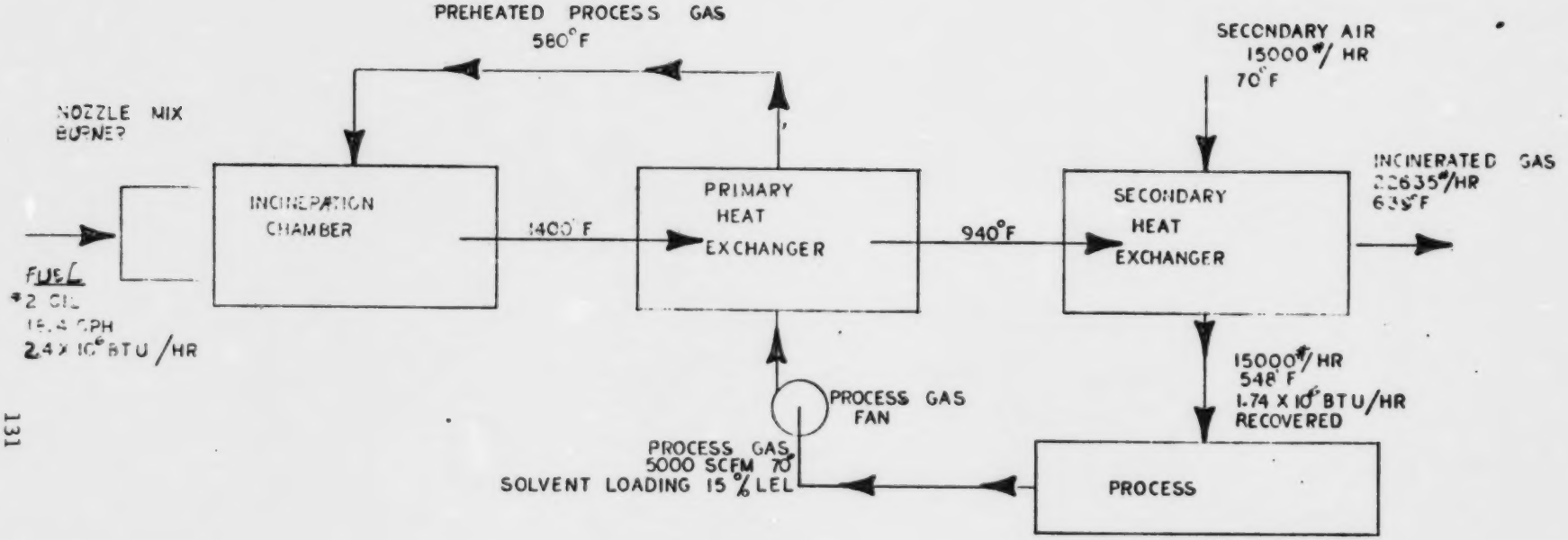
THERMAL INCINERATOR - CASE II FUME INCINERATOR WITH HEAT RECOVERY + CATALYST

PROCESS OPERATING TIME - 2 SHIFTS/DAY - 365 DAYS/YR = 5,840 HRS

ITEM	DESCRIPTION	COST ($/YR)	
UTILITIES:			
WATER,			
STEAM,			
#2 FUEL OIL,	$1.50/10⁶ BTU X 0 X 10⁶/HR X [illegible]		
ELECTRICITY,	$.03/KWH X 5840 HRS X .74[illegible] / 231.1 HP.	30205	—
REPLACE CATALYST,	.0.4141 X $89000. ([illegible]E)	36,027	—
DIRECT LABOR:	.5 HRS/SHIFT X 73[illegible] F[illegible]1R X 8.00/HR	2920	—
SUPPLIES:			
MAINTENANCE			
BUILDING OVERHEAD	[illegible]% OF CAPITAL COSTS		
TAXES & INSURANCE	5 X $ 275,125	68,781	—
INTREST & DEPRECIATION			
	OPERATION AT ABOVE DESIGN CONDITIONS NOT RECOMMENDED		
	TOTAL OPERATING COST		

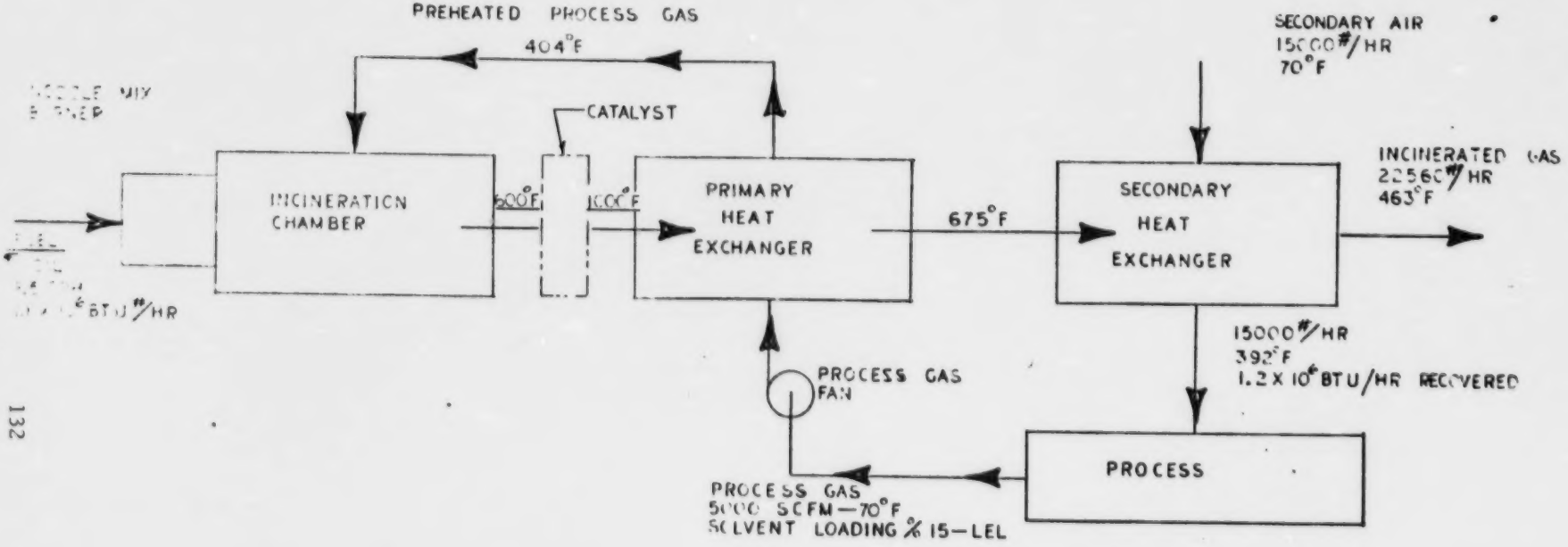
OPERATION AT ABOVE DESIGN CONDITIONS NOT RECOMMENDED

CASE 3, INCINERATION WITH PRIMARY AND SECONDARY HEAT RECOVERY



TYPICAL CASE 3

(PRIMARY AND SECONDARY HEAT EXCHANGER AND NC CATALYST)



TYPICAL CASE 3

(PRIMARY AND SECONDARY HEAT EXCHANGER WITH CATALYST)

CASE 3
WITH PRIMARY HEAT EXCHANGER
WITH SECONDARY HEAT EXCHANGER
NO CATALYST
70°F INLET

PROCESS GAS FLOW IN SCFM	PROCESS GAS FLOW IN #/HR.	INCINERATED GAS FLOW #/HR.	PROCESS GAS IN TEMPERATURE °F	PROCESS GAS PREHEAT TEMPERATURE °F	INCINERATED GAS IN TEMPERATURE °F	GAS TEMPERATURE OUT °F	PRIMARY HEAT EXCHANGER EFFICIENCY %	SECONDARY AIR FLOW IN #/HR.	SECONDARY AIR IN TEMPERATURE °F	SECONDARY AIR OUT TEMPERATURE °F	GAS IN TEMPERATURE °F	GAS OUT TEMPERATURE °F	SECONDARY HEAT EXCHANGER EFFICIENCY °F	LEL %	HEAT RELEASE 10^6 BTU/HR.	BURNER REQUIREMENTS 10^6 BTU/HR. NET	BURNER REQUIREMENTS 10^6 BTU/HR. GROSS	10^6 BTU RECOVERED BY SECONDARY HEAT EXCHANGER 10^6 BTU/HR.	NET FUEL SAVE 10^6 BTU/HR.
5,660	22,550	22,702	70	562	1,600	942	30.5	15,000	70	549	942	640	55.0	0	0	5.07	5.39	1.74	3.33
5,000	22,550	22,733	70	561	1,600	941	30.4	15,000	70	548	941	639	55.0	5	0.85	4.19	4.46	1.74	2.45
4,999	22,500	22,635	70	560	1,600	940	30.4	15,000	70	548	940	639	55.0	15	2.54	2.42	2.58	1.74	0.68
5,000	22,550	22,530	70	579	1,600	939	30.4	15,000	70	548	939	638	55.0	25	4.23	0.68	0.73	1.74	**-1.76
15,900	67,550	68,356	70	562	1,600	942	30.5	45,000	70	549	942	640	55.0	0	0	15.40	16.38	5.20	10.23
15,000	67,500	68,207	70	561	1,600	941	30.4	45,000	70	548	941	639	55.0	5	2.54	12.71	13.52	5.20	7.31
15,300	67,500	67,900	70	560	1,600	940	30.4	45,000	70	548	940	639	55.0	15	7.62	7.36	7.81	5.20	2.16
15,750	67,500	67,609	70	579	1,600	939	30.3	45,000	70	548	939	638	55.0	25	12.71	1.96	2.09	5.20	**-3.24
30,000	135,000	136,691	70	562	1,600	942	30.5	90,000	70	544	942	643	54.4	0	0	30.41	32.35	10.40	19.93
30,000	135,000	136,398	70	561	1,600	941	30.4	90,000	70	544	941	642	54.4	5	5.08	25.13	26.74	10.40	14.85
30,000	135,000	136,800	70	560	1,600	940	30.4	90,000	70	543	940	641	54.4	15	15.23	14.54	15.46	10.40	0.08
30,000	135,000	135,210	70	579	1,600	939	30.3	90,000	70	542	939	640	54.4	25	25.40	3.93	4.17	10.40	**-6.56

**Heat recovered by secondary heat exchanger is greater than heat input by burner.

Reproduced from best available copy.

CASE 2
WITH PRIMARY HEAT EXCHANGER
WITH SECONDARY HEAT EXCHANGER
NO CATALYST
300°F INLET

PROCESS GAS FLOW IN SCFM	PROCESS GAS FLOW IN #/HR.	INCINERATED GAS FLOW #/HR.	PROCESS GAS IN TEMPERATURE °F	PROCESS GAS PREHEAT TEMPERATURE °F	INCINERATED GAS IN TEMPERATURE °F	GAS TEMPERATURE OUT °F	PRIMARY HEAT EXCHANGER EFFICIENCY %	SECONDARY AIR FLOW IN #/HR.	SECONDARY AIR IN TEMPERATURE °F	SECONDARY AIR OUT TEMPERATURE °F	GAS IN TEMPERATURE °F	GAS OUT TEMPERATURE °F	SECONDARY HEAT EXCHANGER EFFICIENCY °F	LEL %	HEAT RELEASE 10^6 BTU/HR.	BURNER REQUIREMENTS 10^6 BTU/HR. NET	BURNER REQUIREMENTS 10^6 BTU/HR. GROSS	BTU RECOVERED BY SECONDARY HEAT EXCHANGER 10^6 BTU/HR.	NET FUEL SAVE 10^6 BTU/HR.
5,000	22,500	22,734	300	725	1,400	1,013	38.7	15,000	70	590	1,013	687	55.2	0	0	4.21	4.48	1.93	[illegible]
5,000	22,500	22,645	300	725	1,400	1,012	38.6	15,000	70	589	1,012	686	55.2	5	0.85	3.32	3.54	1.93	1.42
5,000	22,500	22,567	300	724	1,400	1,011	38.5	15,000	70	589	1,011	686	55.2	15	2.54	1.56	1.66	1.90	**-2.14
5,000	22,500	22,500	300	*690	1,400	1,010	38.4	15,000	70	588	1,010	687	55.2	25	4.23	* .42	* .45	1.90	**-1.48
15,000	67,500	68,213	300	725	1,400	1,013	38.7	45,000	70	590	1,013	687	55.2	0	0	12.77	13.58	5.69	7.08
15,000	67,500	68,061	300	725	1,400	1,012	38.6	45,000	70	589	1,012	686	55.2	5	2.54	10.09	10.73	5.69	4.47
15,000	67,500	67,743	300	724	1,400	1,011	38.5	45,000	70	589	1,011	686	55.2	15	7.62	4.73	5.03	5.68	**-2.06
15,000	67,500	67,444	300	*690	1,400	1,010	38.4	45,000	70	588	1,010	687	55.2	25	12.71	* 1.31	* 1.40	5.68	**-4.37
30,000	135,000	136,476	300	725	1,400	1,013	38.7	90,000	70	585	1,013	690	54.7	0	0	25.20	26.90	11.30	13.99
30,000	135,000	136,111	300	725	1,400	1,012	38.6	90,000	70	585	1,012	690	54.7	5	5.08	19.97	21.25	11.30	8.87
30,000	135,000	135,521	300	724	1,400	1,011	38.5	90,000	70	584	1,011	689	54.6	15	15.23	9.38	9.97	11.28	**-1.82
30,000	135,000	135,000	300	*690	1,400	1,010	38.4	90,000	70	583	1,010	688	54.5	25	25.40	* 2.53	* 2.70	11.28	**-6.67

*Burner at minimum fire, incinerated gases are bypassed around primary heat exchanger.

**Heat recovered by secondary heat exchanger is greater than heat input by burner.

CASE 3
WITH PRIMARY HEAT EXCHANGER
WITH SECONDARY HEAT EXCHANGER
WITH CATALYST
@ 70°F INLET

PROCESS GAS FLOW IN S/TY	PROCESS GAS FLOW IN #/HR.	INCINERATED GAS FLOW #/HR.	PROCESS GAS IN TEMPERATURE °F	PROCESS GAS PREHEAT TEMPERATURE °F	INCINERATED GAS IN TEMPERATURE °F	GAS TEMPERATURE OUT °F	PRIMARY HEAT EXCHANGER EFFICIENCY %	SECONDARY AIR FLOW IN #/HR.	SECONDARY AIR IN TEMPERATURE °F	SECONDARY AIR OUT TEMPERATURE °F	GAS IN TEMPERATURE °F	GAS OUT TEMPERATURE °F	SECONDARY HEAT EXCHANGER EFFICIENCY °F	LEL %	HEAT RELEASE 10^6 BTU/HR.	BURNER REQUIREMENTS 10^6 BTU/HR. NET	10^6 BTU/HR. GROSS	BTU RECOVERED BY SECONDARY HEAT EXCHANGER 10^6 BT/YR.	NET FUEL RATE 10^6 BTU/YR.
9,500	22,500	22,606	70	260	600	416	35.9	15,000	70	254	416	295	53.3	0	0	1.91	2.01	0.67	1.24
9,500	22,500	22,550	70	310	740	506	35.9	15,000	70	302	506	353	53.3	5	0.615	1.63	1.72	0.84	0.79
9,500	22,500	22,549	70	404	1,000	675	36.0	15,000	70	393	675	463	53.3	15	3.34	3.11	2.29	1.19	**-0.76
9,500	22,500	22,507	70	479	*1,210	806	36.2	15,000	70	462	806	548	53.3	25	6.66	.19	.2	1.42	**-1.2
15,500	67,500	67,820	70	260	600	416	35.9	45,000	70	254	416	295	53.3	0	0	5.72	6.10	2.00	3.73
15,500	67,500	67,772	70	310	740	506	35.9	45,000	70	302	506	353	53.3	5	2.44	4.89	5.08	2.52	2.37
15,500	67,500	67,685	70	404	1,000	675	36.0	45,000	70	393	675	463	53.3	15	7.31	3.32	3.94	3.51	**-0.19
15,500	67,500	67,520	70	479	*1,210	806	36.2	45,000	70	462	806	548	53.3	25	13.30	.57	.61	4.26	**-1.72
35,500	135,000	135,638	70	260	600	416	35.9	90,000	70	254	416	295	53.3	0	0	11.46	12.20	4.00	7.48
35,500	135,000	135,545	70	310	740	506	35.9	90,000	70	302	506	353	53.3	5	4.88	9.80	10.43	5.04	4.75
35,500	135,000	135,370	70	404	1,000	675	36.0	90,000	70	393	675	463	53.3	15	14.68	6.65	7.88	7.02	**-0.37
35,500	135,000	135,040	70	479	*1,210	806	36.2	90,000	70	462	806	548	53.3	25	26.70	*1.15	*1.35	8.52	**-7.17

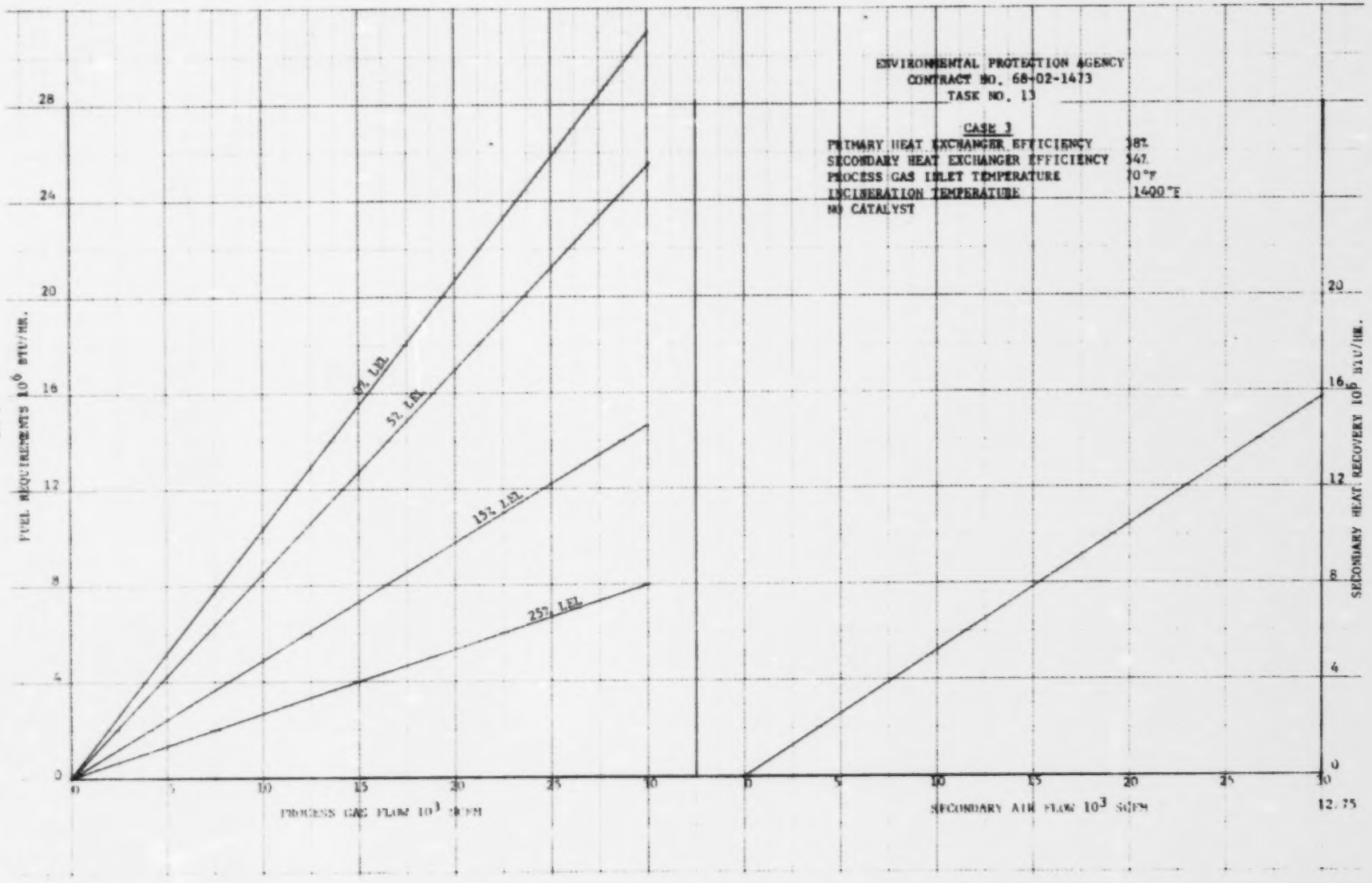
*Burner is at minimum fire, gas temp. into catalyst is lower than what is generally recommended. Gas temp. leaving catalyst is higher than what is generally recommended.
**Heat recovered by secondary heat exchanger is greater than heat input by burner.

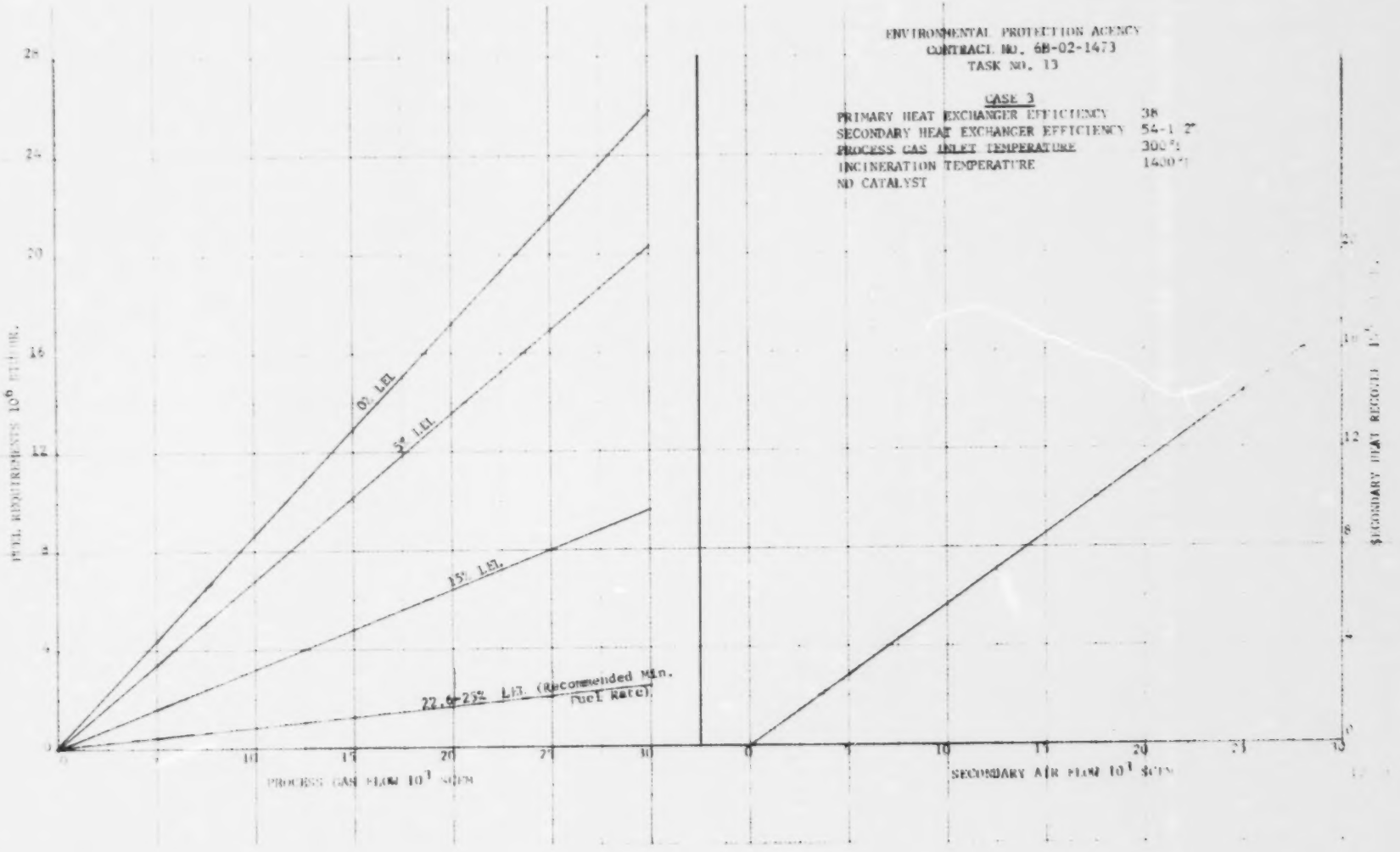
Reproduced from best available copy.

CASE 3
WITH PRIMARY HEAT EXCHANGER
WITH SECONDARY HEAT EXCHANGER
WITH CATALYST
300°F INLET

PROCESS GAS FLOW IN / SCFM	PROCESS GAS FLOW IN #/HR.	INCINERATED GAS FLOW #/HR.	PROCESS GAS IN TEMPERATURE °F	PROCESS GAS PREHEAT TEMPERATURE °F	INCINERATED GAS IN TEMPERATURE °F	GAS TEMPERATURE OUT °F	PRIMARY HEAT EXCHANGER EFFICIENCY %	SECONDARY AIR FLOW IN #/HR.	SECONDARY AIR IN TEMPERATURE °F	SECONDARY AIR OUT TEMPERATURE °F	GAS IN TEMPERATURE °F	GAS OUT TEMPERATURE °F	SECONDARY HEAT EXCHANGER EFFICIENCY °F	LEL %	HEAT RELEASED 10^6 BTU/HR.	FURNACE REQUIREMENTS 10^6 BTU/HR. NET	FURNACE REQUIREMENTS 10^6 BTU/HR. GROSS	BTU RECOVERED BY SECONDARY HEAT EXCHANGER 10^6 BTU/HR.	NET FUEL SAVE $ PER YR.
5,000	22,500	22,563	300	600	600	691	36.5	15,000	70	290	493	341	53.0	0	0	1.13	1.21	0.62	7.31
5,000	22,500	22,590	300	660	760	583	36.6	15,000	70	346	583	390	53.0	5	0.015	0.79	0.84	1.00	+0.31
5,000	22,500	22,540	300	555	1,000	750	36.0	15,000	70	436	750	505	53.0	15	2.34	0.35	0.37	1.11	+1.07
Per 25% LEL - Primary Product Temperature Higher Than Minimum Required Into Catalyst - Refer to Case 2 For Performance																			
15,000	67,500	67,690	300	600	660	691	36.5	45,000	70	290	493	341	53.0	0	0	2.30	2.42	2.07	0.92
15,000	67,500	67,650	300	660	760	583	36.6	45,000	70	346	583	390	53.0	5	2.66	2.30	2.53	3.00	+0.93
15,000	67,500	67,543	300	556	1,000	750	36.0	45,000	70	436	750	505	53.0	15	7.31	0.77	0.68	3.99	+3.32
Per 25% LEL - See Data Above																			
30,000	135,000	135,377	300	600	660	691	36.5	90,000	70	290	493	341	53.0	0	0	6.78	7.25	6.84	1.84
30,000	135,000	135,545	300	660	760	583	36.6	90,000	70	346	583	390	53.0	5	6.00	6.76	5.07	6.00	+1.86
30,000	135,000	135,086	300	555	1,000	750	36.0	90,000	70	436	750	505	53.0	15	14.61	1.54	1.48	8.00	+6.46
Per 25% LEL - See Data Above																			

*Heat recovered by secondary heat exchanger is greater than heat input by burner.

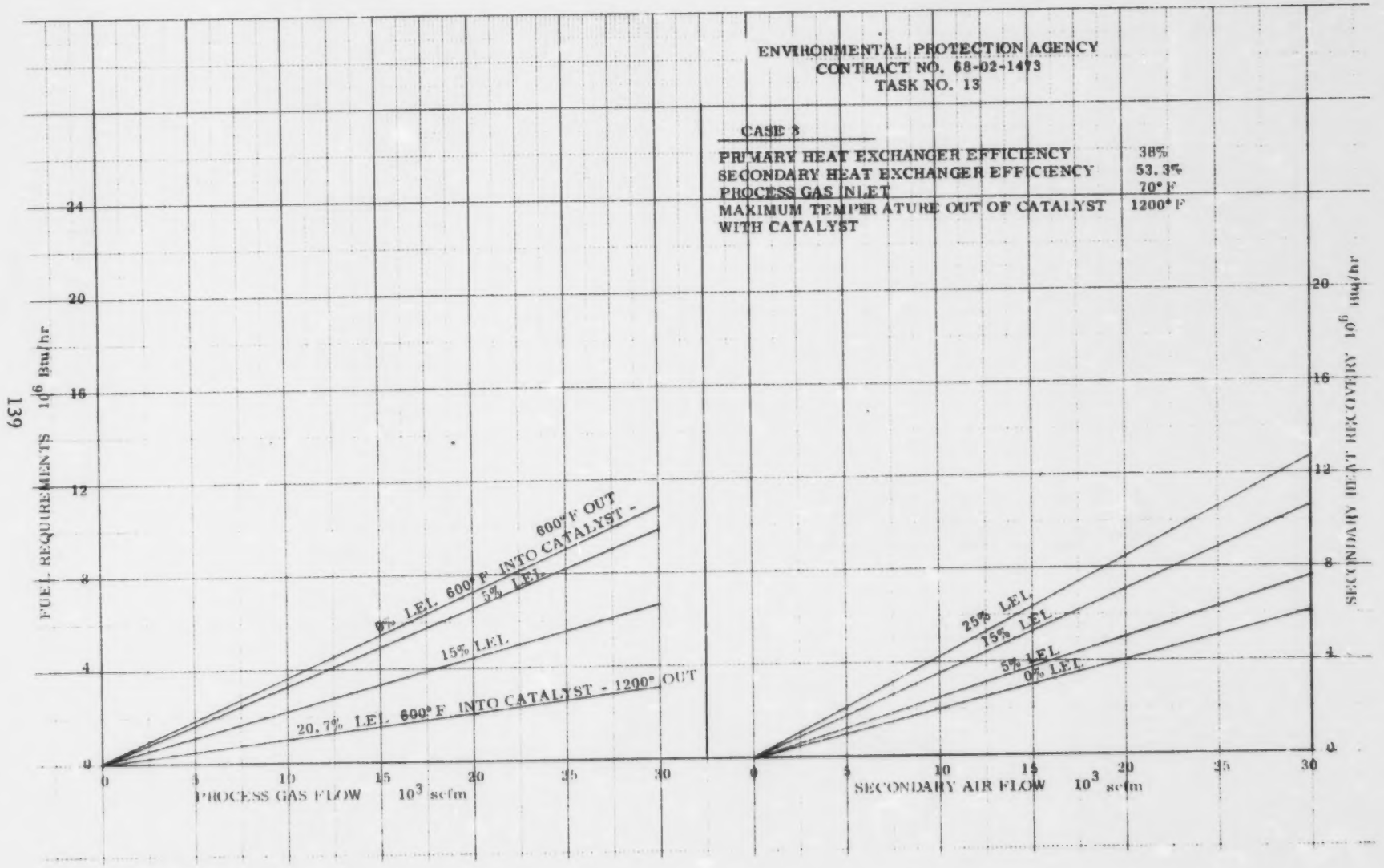

ENVIRONMENTAL PROTECTION AGENCY
CONTRACT NO. 68-02-1473
TASK NO. 13
CASE 3
PRIMARY HEAT EXCHANGER EFFICIENCY 18%
SECONDARY HEAT EXCHANGER EFFICIENCY 54%
PROCESS GAS INLET TEMPERATURE 70°F
INCINERATION TEMPERATURE 1400°F
NO CATALYST
FUEL REQUIREMENTS 10^6 BTU/HR.
SECONDARY HEAT RECOVERY 10^6 BTU/HR.
PROCESS GAS FLOW 10^3 SCFM
SECONDARY AIR FLOW 10^3 SCFM
0
4
8
12
16
20
24
28
0
5
10
15
20
25
30
0
5
10
15
20
25
30
0
4
8
12
16
20
25% LEL
15% LEL
5% LEL
2% LEL


ENVIRONMENTAL PROTECTION AGENCY
CONTRACT NO. 68-02-1473
TASK NO. 13
CASE 3
PRIMARY HEAT EXCHANGER EFFICIENCY 38
SECONDARY HEAT EXCHANGER EFFICIENCY 54-1 2"
PROCESS GAS INLET TEMPERATURE 300°F
INCINERATION TEMPERATURE 1400°F
NO CATALYST
0% LEL
5% LEL
15% LEL
22.6-25% LEL (Recommended Min. Duct Rate)
FUEL REQUIREMENTS 10⁶ BTU/HR.
PROCESS GAS FLOW 10³ SCFM
SECONDARY AIR FLOW 10³ SCFM
SECONDARY HEAT RECOVERY

ENVIRONMENTAL PROTECTION AGENCY
CONTRACT NO. 68-02-1473
TASK NO. 13

CASE 8

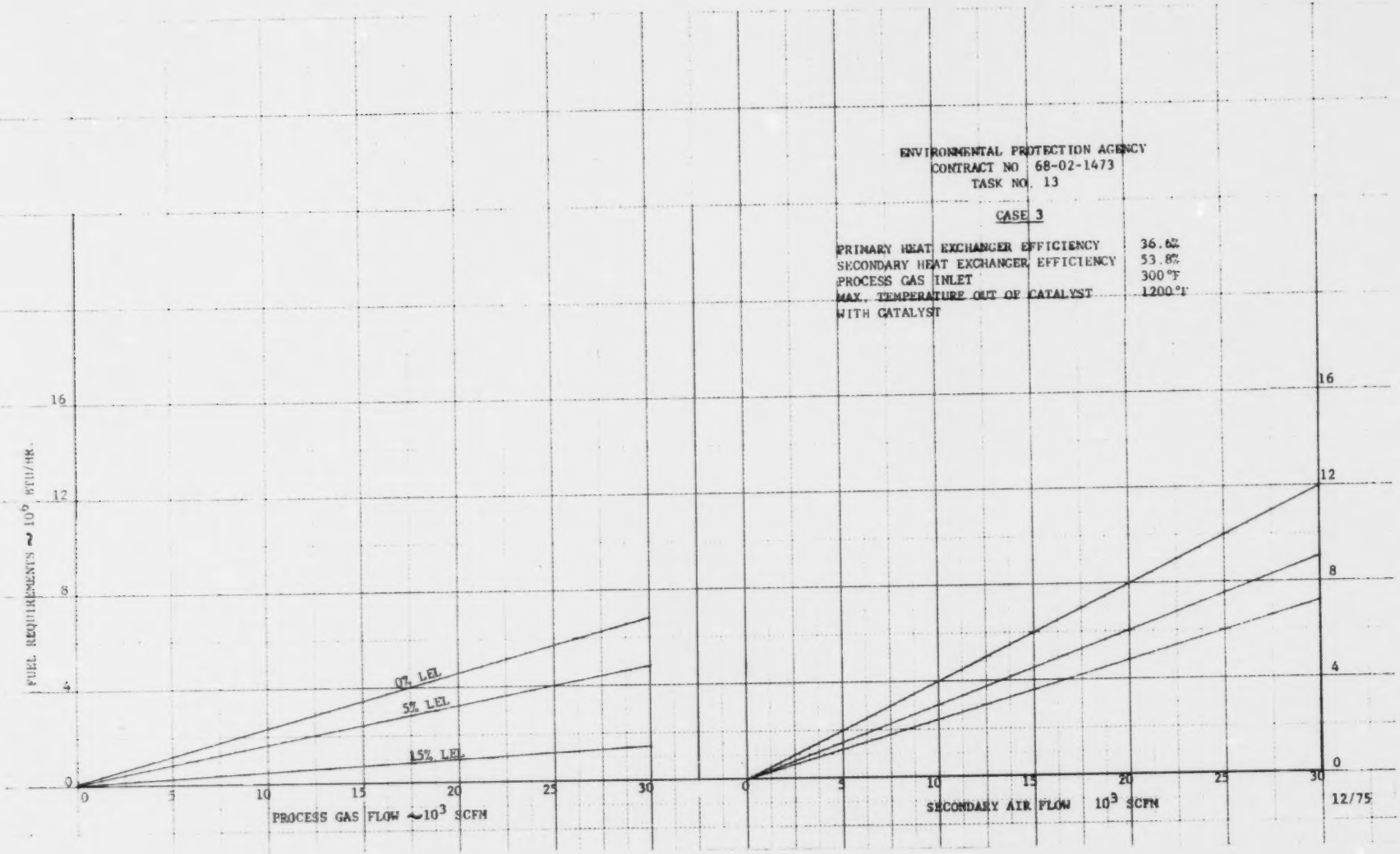
PRIMARY HEAT EXCHANGER EFFICIENCY	38%
SECONDARY HEAT EXCHANGER EFFICIENCY	53.3%
PROCESS GAS INLET	70° F
MAXIMUM TEMPERATURE OUT OF CATALYST WITH CATALYST	1200° F

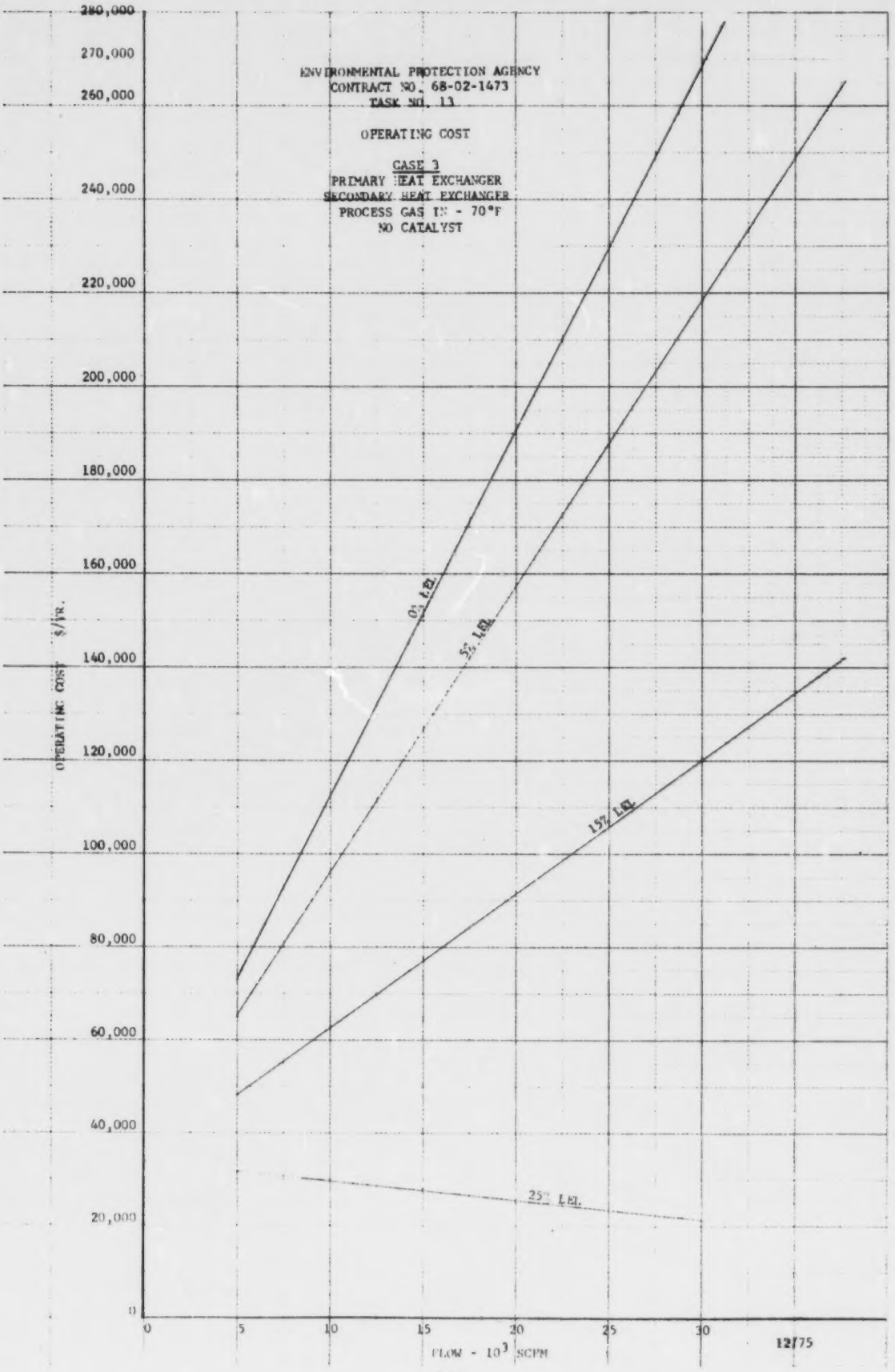


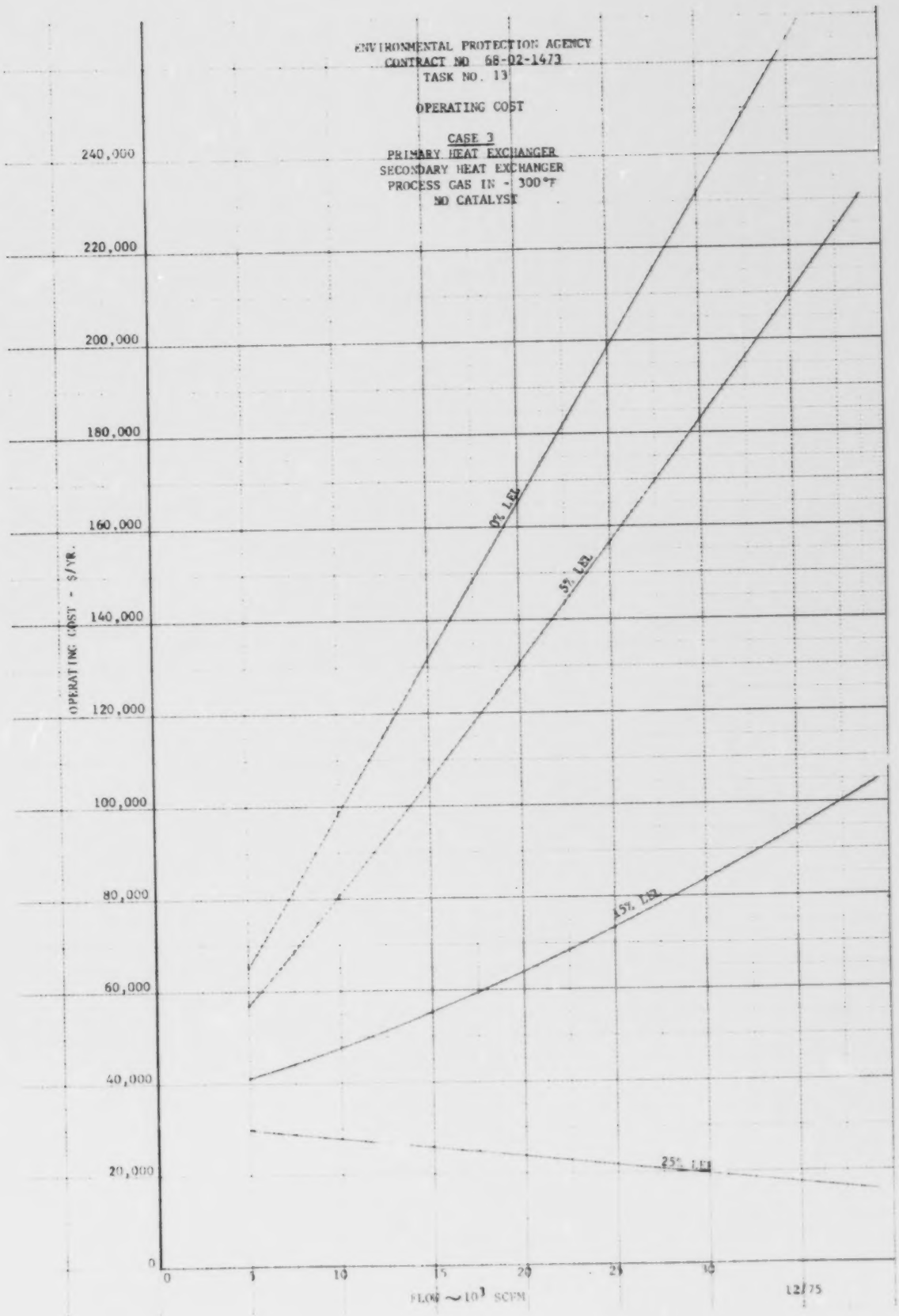
ENVIRONMENTAL PROTECTION AGENCY
CONTRACT NO. 68-02-1473
TASK NO. 13

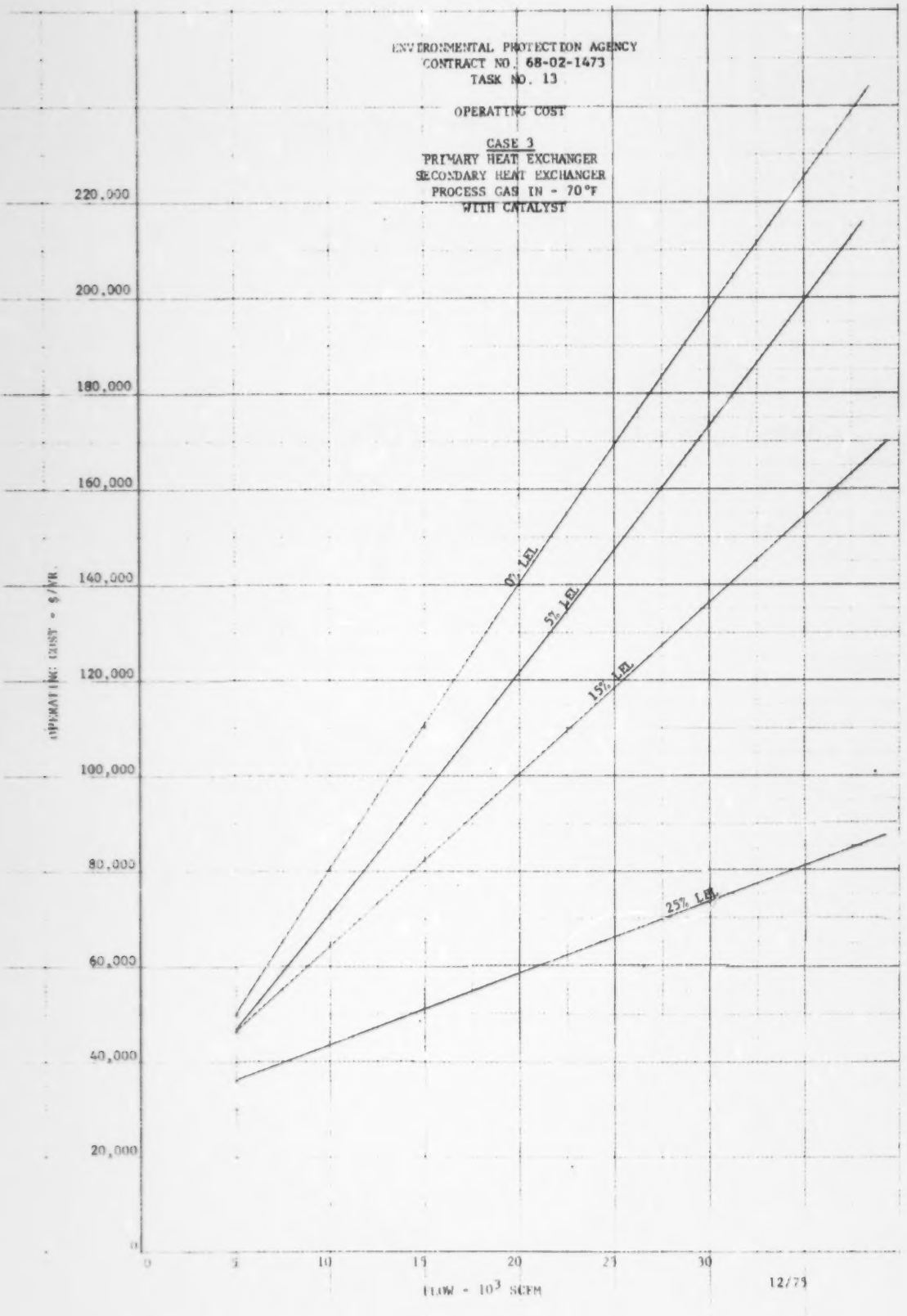
CASE 3

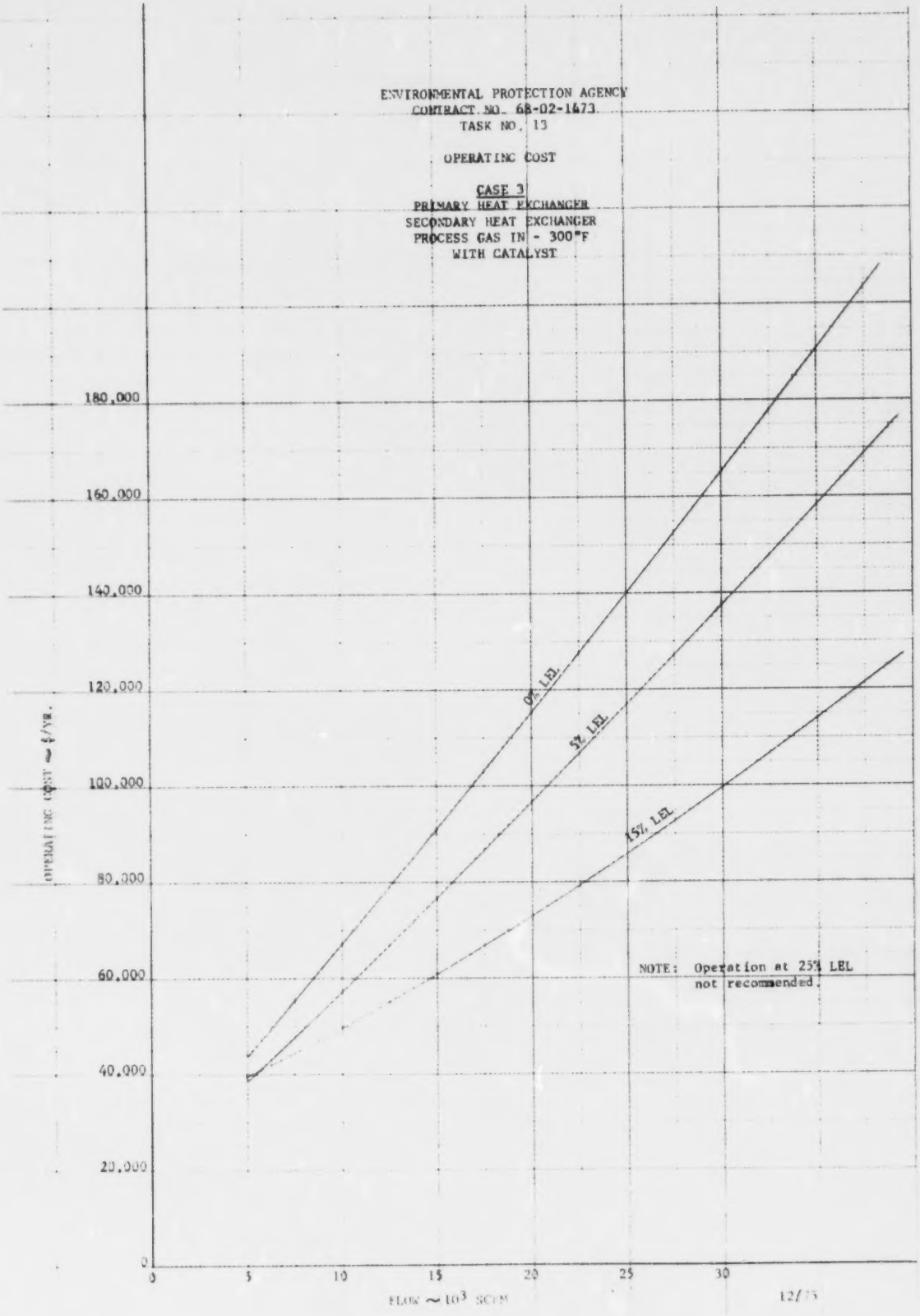
PRIMARY HEAT EXCHANGER EFFICIENCY	36.6%
SECONDARY HEAT EXCHANGER EFFICIENCY	53.8%
PROCESS GAS INLET	300°F
MAX. TEMPERATURE OUT OF CATALYST WITH CATALYST	1200°F




ENVIRONMENTAL PROTECTION AGENCY
CONTRACT NO. 68-02-1473
TASK NO. 13
OPERATING COST
CASE 3
PRIMARY HEAT EXCHANGER
SECONDARY HEAT EXCHANGER
PROCESS GAS IN - 70°F
NO CATALYST
OPERATING COST $/YR.
280,000
270,000
260,000
240,000
220,000
200,000
180,000
160,000
140,000
120,000
100,000
80,000
60,000
40,000
20,000
0
0% LEL
5% LEL
15% LEL
25% LEL
0
5
10
15
20
25
30
FLOW - 10³ SCFM
12/75


ENVIRONMENTAL PROTECTION AGENCY
CONTRACT NO 68-02-1473
TASK NO. 13
OPERATING COST
CASE 3
PRIMARY HEAT EXCHANGER
SECONDARY HEAT EXCHANGER
PROCESS GAS IN - 300°F
NO CATALYST
OPERATING COST - $/YR.
240,000
220,000
200,000
180,000
160,000
140,000
120,000
100,000
80,000
60,000
40,000
20,000
0
0% LEL
5% LEL
15% LEL
25% LEL
0
5
10
15
20
25
30
12.75
FLOW ~10³ SCFM


ENVIRONMENTAL PROTECTION AGENCY
CONTRACT NO. 68-02-1473
TASK NO. 13
OPERATING COST
CASE 3
PRIMARY HEAT EXCHANGER
SECONDARY HEAT EXCHANGER
PROCESS GAS IN - 70°F
WITH CATALYST
0% LEL
5% LEL
15% LEL
25% LEL
OPERATING COST - $/YR.
220,000
200,000
180,000
160,000
140,000
120,000
100,000
80,000
60,000
40,000
20,000
0
0
5
10
15
20
25
30
FLOW - 10^3 SCFM
12/73


ENVIRONMENTAL PROTECTION AGENCY
CONTRACT NO. 68-02-1473
TASK NO. 13
OPERATING COST
CASE 3
PRIMARY HEAT EXCHANGER
SECONDARY HEAT EXCHANGER
PROCESS GAS IN - 300°F
WITH CATALYST
180,000
160,000
140,000
120,000
100,000
80,000
60,000
40,000
20,000
0
0% LEL
5% LEL
15% LEL
NOTE: Operation at 25% LEL not recommended.
0
5
10
15
20
25
30
FLOW ~ 10^3 SCFM
12/75

Operating Cost Estimate

Unit Size 5000 SCFM 0 % LEL Process Temp. 70°F

Control Equipment Description

Thermal Incinerator - Case III Fume Incinerator
With Primary & Secondary Heat Exchangers
No Catalyst

Process Operating Time - 2 shifts/day - 365 days/yr = 5,840 hrs

Item	Description	Cost ($/yr)	
Utilities:			
Water,			
Steam,			
#2 Fuel Oil,	$1.50/10⁶ BTU x 5.4 x10⁶/hr x 5840 hrs	47304	
Electricity,	$.03/KWH x 5840 hrs x .746 KW/HP x 15.6 HP.	2039	
Direct Labor:	.5 hrs/shift x 730 shifts/yr x 8.00/hr	2920	—
Supplies:			
Maintenance Building Overhead Taxes & Insurance Interest & Depreciation	Use 25% of Capital Costs .25 x $ 142,740.	35,685	—
Secondary Recovery	$1.50/10⁶ BTU x 1.7 x10⁶/hr x 5840 hrs Savings	- 14,892	—
	Total Operating Cost	73056	

OPERATING COST ESTIMATE

UNIT SIZE 5000 SCFM 5% LEL PROCESS TEMP. 70°F

CONTROL EQUIPTMENT DESCRIPTION

THERMAL INCINERATOR - CASE III FUME INCINERATOR WITH PRIMARY & SECONDARY HEAT EXCHANGERS NO CATALYST

PROCESS OPERATING TIME - 2 SHIFTS/DAY - 365 DAYS/YR = 5,840 HRS

ITEM	DESCRIPTION	COST ($/YR)	
UTILITIES:			
WATER,			
STEAM,			
#2 FUEL OIL,	$1.50/10⁶ BTU x 4.5 x10⁶/HR x 5840 HRS	39420	
ELECTRICITY,	$.03/KWH x 5840 HRS x .746 KW/HP x 15.6 HP.	2039	
DIRECT LABOR:	.5 HRS/SHIFT x 730 SHIFTS/YR x 8.00/HR	2920	—
SUPPLIES:			
MAINTENANCE BUILDING OVERHEAD TAXES & INSURANCE INTEREST & DEPRECIATION	USE 25% OF CAPITAL COSTS .25 x $ 142,470	35,685	—
SECONDARY RECOVERY	$1.50/10⁶ BTU x 1.7 x10⁶/HR x 5840 HRS SAVINGS	- 14,892	—
	TOTAL OPERATING COST	65172	

OPERATING COST ESTIMATE

UNIT SIZE 5000 SCFM 15% LEL PROCESS TEMP. 70°F

CONTROL EQUIPTMENT DESCRIPTION

THERMAL INCINERATOR - CASE III FUME INCINERATOR WITH PRIMARY & SECONDARY HEAT EXCHANGERS NO CATALYST

PROCESS OPERATING TIME - 2 SHIFTS/DAY - 365 DAYS/YR = 5,840 HRS

ITEM	DESCRIPTION	COST ($/YR)	
UTILITIES:			
WATER,			
STEAM,			
#2 FUEL OIL,	$1.50/10⁶ BTU X 2.6 X 10⁶/HR X 5840 HRS	22776	
ELECTRICITY,	$.03/KWH X 5840 HRS X .746 KW/HP X 15.6 HP.	2039	
DIRECT LABOR:	.5 HRS/SHIFT X 730 SHIFTS/YR X 8.00/HR	2920	—
SUPPLIES:			
MAINTENANCE BUILDING OVERHEAD TAXES & INSURANCE INTEREST & DEPRECIATION	USE 25% OF CAPITAL COSTS .25 X $ 142,470.	35,685	—
SECONDARY RECOVERY	$1.50/10⁶ BTU X 1.7 X 10⁶/HR X 5840 HRS SAVINGS	14892	—
	TOTAL OPERATING COST	$8528	

OPERATING COST ESTIMATE

UNIT SIZE 5000 SCFM 25 % LEL PROCESS TEMP. 70°F

CONTROL EQUIPTMENT DESCRIPTION

THERMAL INCINERATOR - CASE III FUME INCINERATOR WITH PRIMARY & SECONDARY HEAT EXCHANGERS NO CATALYST

PROCESS OPERATING TIME - 2 SHIFTS/DAY - 365 DAYS/YR = 5,840 HRS

ITEM	DESCRIPTION	COST ($/YR)	
UTILITIES:			
WATER,			
STEAM,			
#2 FUEL OIL,	$1.50/10⁶ BTU × .7 ×10⁶/HR × 5840 HRS	6132	
ELECTRICITY,	$.03/KWH × 5840 HRS × .746 KW/HP × 15.6 HP.	2039	
DIRECT LABOR:	.5 HRS/SHIFT × 730 SHIFTS/YR × 8.00/HR	2920	—
SUPPLIES:			
MAINTENANCE BUILDING OVERHEAD TAXES & INSURANCE INTEREST & DEPRECIATION	USE 25% OF CAPITAL COSTS .25 × $ 142,470.	35685	—
SECONDARY RECOVERY	$1.50/10⁶ BTU × 1.7 ×10⁶/HR × 5840 HRS SAVINGS	14,892	—
	TOTAL OPERATING COST	31884	

Operating Cost Estimate

Unit Size 15,000 SCFM 0 % LEL Process Temp. 70°F

Control Equipment Description

Thermal Incinerator - Case III Fume Incinerator

With Primary & Secondary Heat Exchangers

No Catalyst

Process Operating Time - 2 shifts/day - 365 days/yr = 5,840 hrs

Item	Description	Cost ($/yr)	
Utilities:			
Water,			
Steam,			
#2 Fuel Oil,	$1.50/10⁶ BTU x 16.4 x 10⁶/hr x 5840 hrs	143664	
Electricity,	$.03/KWH x 5840 hrs x .746 KW/HP x 50.4 HP.	6587	
Direct Labor:	.5 hrs/shift x 730 shifts/yr x 8.00/hr	2920	—
Supplies:			
Maintenance Building Overhead Taxes & Insurance Interest & Depreciation	Use 25% of capital costs .25 x $ 182,765	45,691	—
Secondary Recovery	$1.50/10⁶ BTU x 5.2 x 10⁶/hr x 5840 hrs Savings	- 45,552	—
	Total Operating Cost	153310	

Operating Cost Estimate

Unit Size 15,000 SCFM 5 % LEL Process Temp. 70°F

Control Equipment Description

Thermal Incinerator - Case III Fume Incinerator

With Primary & Secondary Heat Exchangers

No Catalyst

Process Operating Time - 2 Shifts/Day - 365 Days/Yr = 5,840 Hrs

Item	Description	Cost ($/Yr)	
Utilities:			
Water,			
Steam,			
#2 Fuel Oil,	$1.50/10⁶ BTUx 13.5 x10⁶/HR x 5840 HRS	118260	
Electricity,	$.03/KWH x 5840 HRS x .746 KW/HP x 50.4 HP.	6587	
Direct Labor:	.5 HRS/Shift x 730 Shifts/Yr x 8.00/ HR	2920	—
Supplies:			
Maintenance Building Overhead Taxes & Insurance Interest & Depreciation	Use 25% of Capital Costs .25 x $ 182,765	45,691	
Secondary Recovery	$1.50/10⁶ BTU x 5.2x10⁶/HR x 5840 HRS Savings	45,552	—
	Total Operating Cost	127906	

OPERATING COST ESTIMATE

UNIT SIZE 15,000 SCFM 15 % LEL PROCESS TEMP. 70°F

CONTROL EQUIPTMENT DESCRIPTION

THERMAL INCINERATOR - CASE III FUME INCINERATOR WITH PRIMARY & SECONDARY HEAT EXCHANGERS NO CATALYST

PROCESS OPERATING TIME - 2 SHIFTS/DAY - 365 DAYS/YR = 5,840 HRS

ITEM	DESCRIPTION	COST ($/YR)	
UTILITIES:			
WATER,			
STEAM,			
#2 FUEL OIL,	$1.50/10⁶ BTU x 7.8 x10⁶/HR x 5840 HRS	68328	
ELECTRICITY,	$.03/KWH x 5840 HRS x .746 KW/HP x 50.4 HP.	6567	
DIRECT LABOR:	.5 HRS/SHIFT x 730 SHIFTS/YR x 8.00/HR	2920	—
SUPPLIES:			
MAINTENANCE BUILDING OVERHEAD TAXES & INSURANCE INTEREST & DEPRECIATION	USE 25% OF CAPITAL COSTS .25 x $ 182,765	45691	
SECONDARY RECOVERY	$1.50/10⁶ BTU x 5.2 x10⁶/HR x 5840 HRS SAVINGS	-45,552	—
	TOTAL OPERATING COST	77974	

OPERATING COST ESTIMATE

UNIT SIZE 15,000 SCFM 25% LEL PROCESS TEMP. 70°F

CONTROL EQUIPTMENT DESCRIPTION

THERMAL INCINERATOR - CASE III FUME INCINERATOR WITH PRIMARY & SECONDARY HEAT EXCHANGERS NO CATALYST

PROCESS OPERATING TIME - 2 SHIFTS/DAY - 365 DAYS/YR = 5,840 HRS

ITEM	DESCRIPTION	COST ($/YR)	
UTILITIES: WATER, STEAM, #2 FUEL OIL,	$1.50/10⁶ BTU × 2.1 ×10⁶/HR × 5840 HRS	18396	
ELECTRICITY,	$.03/KWH × 5840 HRS × .746 KW/HP × 50.4 HP.	6587	
DIRECT LABOR:	.5 HRS/SHIFT × 730 SHIFTS/YR × 8.00/HR	2920	—
SUPPLIES:			
MAINTENANCE, BUILDING OVERHEAD, TAXES & INSURANCE, INTEREST & DEPRECIATION	USE 25% OF CAPITAL COSTS .25 × $ 182,765	45691	
SECONDARY RECOVERY	$1.50/10⁶ BTU × 5.2 ×10⁶/HR × 5840 HRS SAVINGS	45,552	—
	TOTAL OPERATING COST	28,042	

OPERATING COST ESTIMATE

UNIT SIZE 30,000 SCFM 0 % LEL PROCESS TEMP. 70°F

CONTROL EQUIPTMENT DESCRIPTION

THERMAL INCINERATOR - CASE III FUME INCINERATOR WITH PRIMARY & SECONDARY HEAT EXCHANGERS NO CATALYST

PROCESS OPERATING TIME - 2 SHIFTS/DAY - 365 DAYS/YR = 5,840 HRS

ITEM	DESCRIPTION	COST ($/YR)
UTILITIES: WATER, STEAM, #2 FUEL OIL,	$1.50/10⁶ BTU x 32.4 x 10⁶/HR x 5840 HRS	283824
ELECTRICITY,	$.03/KWH x 5840 HRS x .746 KW/HP x 123.0 HP.	16076
DIRECT LABOR:	.5 HRS/SHIFT x 730 SHIFTS/YR x 8.00/HR	2920 —
SUPPLIES:		
MAINTENANCE, BUILDING OVERHEAD, TAXES & INSURANCE, INTEREST & DEPRECIATION	USE 25% OF CAPITAL COSTS .25 x $ 230,440	57,610
SECONDARY RECOVERY	$1.50/10⁶ BTU x 10.5 x 10⁶/HR x 5840 HRS SAVINGS	-91,980
	TOTAL OPERATING COST	268450

OPERATING COST ESTIMATE

UNIT SIZE 30,000 SCFM 5% LEL PROCESS TEMP. 70°F

CONTROL EQUIPTMENT DESCRIPTION

THERMAL INCINERATOR - CASE III FUME INCINERATOR

WITH PRIMARY & SECONDARY HEAT EXCHANGERS

NO CATALYST

PROCESS OPERATING TIME - 2 SHIFTS/DAY - 365 DAYS/YR = 5,840 HRS

ITEM	DESCRIPTION	COST ($/YR)	
UTILITIES:			
WATER,			
STEAM,			
#2 FUEL OIL,	$1.50/10⁶ BTU x 26.7 x 10⁶/HR x 5840 HRS	233892	
ELECTRICITY,	$.03/KWH x 5840 HRS x .746 KW/HP x 123.0 HP.	16076	
DIRECT LABOR:	.5 HRS/SHIFT x 730 SHIFTS/YR x 8.00/HR	2920	—
SUPPLIES:			
MAINTENANCE BUILDING OVERHEAD TAXES & INSURANCE INTEREST & DEPRECIATION	USE 25% OF CAPITAL COSTS .25 x $ 230,440	57,610	—
SECONDARY RECOVERY	$1.50/10⁶ BTU x 10.5 x 10⁶/HR x 5840 HRS SAVINGS	-91,980	—
	TOTAL OPERATING COST	218518	

OPERATING COST ESTIMATE

UNIT SIZE 30,000 SCFM 15 % LEL PROCESS TEMP. 70°F

CONTROL EQUIPTMENT DESCRIPTION

THERMAL INCINERATOR - CASE III FUME INCINERATOR WITH PRIMARY & SECONDARY HEAT EXCHANGERS NO CATALYST

PROCESS OPERATING TIME - 2 SHIFTS/DAY - 365 DAYS/YR = 5,840 HRS

ITEM	DESCRIPTION	COST ($/YR)
UTILITIES: WATER, STEAM, #2 FUEL OIL,	$1.50/10⁶ BTU X 15.5 X 10⁶/HR X 5840 HRS	135780
ELECTRICITY,	$.03/KWH X 5840 HRS X .746 KW/HP X 123.0 HP.	16076
DIRECT LABOR:	.5 HRS/SHIFT X 730 SHIFTS/YR X 8.00/HR	2920 —
SUPPLIES:		
MAINTENANCE, BUILDING OVERHEAD, TAXES & INSURANCE, INTEREST & DEPRECIATION	USE 25% OF CAPITAL COSTS .25 X $ 230,440	57,610 —
SECONDARY RECOVERY	$1.50/10⁶ BTU X 10.5 X 10⁶/HR X 5840 HRS SAVINGS —	91,980 —
	TOTAL OPERATING COST	120406

Operating Cost Estimate

Unit Size 30,000 SCFM 25% LEL Process Temp. 70°F

Control Equipment Description

Thermal Incinerator - Case III Fume Incinerator

with Primary & Secondary Heat Exchangers

No Catalyst

Process Operating Time - 2 shifts/day - 365 days/yr = 5,840 hrs

Item	Description	Cost ($/yr)	
Utilities:			
Water,			
Steam,			
#2 Fuel Oil,	$1.50/10⁶ BTU x 4.2 x10⁶/hr x 5840 hrs	36792	
Electricity,	$.03/KWH x 5840 hrs x .746 KW/HP x 123.0 HP.	16076	
Direct Labor:	.5 hrs/shift x 730 shifts/yr x 8.00/hr	2920	—
Supplies:			
Maintenance Building Overhead Taxes & Insurance Interest & Depreciation	Use 25% of capital costs .25 x $ 230,440	57,610	
Secondary Recovery	$1.50/10⁶ BTU x 10.5x10⁶/hr x 5840 hrs Savings	91,980	—
	Total Operating Cost	21418	

OPERATING COST ESTIMATE

UNIT SIZE 5000 SCFM 0 % LEL PROCESS TEMP. 300°F

CONTROL EQUIPTMENT DESCRIPTION

THERMAL INCINERATOR - CASE III FUME INCINERATOR WITH PRIMARY & SECONDARY HEAT EXCHANGERS NO CATALYST

PROCESS OPERATING TIME - 2 SHIFTS/DAY - 365 DAYS/YR = 5,840 HRS

ITEM	DESCRIPTION	COST ($/YR)	
UTILITIES:			
WATER,			
STEAM,			
#2 FUEL OIL,	$1.50/10⁶ BTU X 4.5 X10⁶/HR X 5840 HRS	39420	
ELECTRICITY,	$.03/KWH X 5840 HRS X .746 KW/HP X 32.9 HP.	4300	
DIRECT LABOR:	.5 HRS/SHIFT X 730 SHIFTS/YR X 8.00/HR	2920	—
SUPPLIES:			
MAINTENANCE BUILDING OVERHEAD TAXES & INSURANCE INTEREST & DEPRECIATION	USE 25% OF CAPITAL COSTS .25 X $ 142,470	35,685	—
SECONDARY RECOVERY	$1.50/10⁶ BTU X 1.9 X10⁶/HR X 5840 HRS SAVINGS	- 16,644	—
	TOTAL OPERATING COST	65681	

OPERATING COST ESTIMATE

UNIT SIZE 5000 SCFM 5 % LEL PROCESS TEMP. 300°F

CONTROL EQUIPTMENT DESCRIPTION

THERMAL INCINERATOR - CASE III FUME INCINERATOR

WITH PRIMARY & SECONDARY HEAT EXCHANGERS

NO CATALYST

PROCESS OPERATING TIME - 2 SHIFTS/DAY - 365 DAYS/YR = 5,840 HRS

ITEM	DESCRIPTION	COST ($/YR)	
UTILITIES: WATER, STEAM, #2 FUEL OIL, ELECTRICITY,	$1.50/10⁶ BTU X 3.5 x10⁶/HR X 5840 HRS	30660	
	$.03/KWH X 5840 HRS X .746 KW/HP X 32.9 HP.	4300	
DIRECT LABOR:	.5 HRS/SHIFT X 730 SHIFTS/YR X 8.00/HR	2920	—
SUPPLIES:			
MAINTENANCE, BUILDING OVERHEAD, TAXES & INSURANCE, INTEREST & DEPRECIATION	USE 25% OF CAPITAL COSTS .25 X $ 142,470.	35,685	—
SECONDARY RECOVERY	$1.50/10⁶ BTU X 1.9 x10⁶/HR X 5840 HRS SAVINGS	-16,644	—
	TOTAL OPERATING COST	56921	

OPERATING COST ESTIMATE

UNIT SIZE 5000 SCFM 15 % LEL PROCESS TEMP. 300°F

CONTROL EQUIPTMENT DESCRIPTION

THERMAL INCINERATOR - CASE III FUME INCINERATOR WITH PRIMARY & SECONDARY HEAT EXCHANGERS NO CATALYST

PROCESS OPERATING TIME - 2 SHIFTS/DAY - 365 DAYS/YR = 5,340 HRS

ITEM	DESCRIPTION	COST ($/YR)	
UTILITIES:			
WATER,			
STEAM,			
#2 FUEL OIL,	$1.50/10⁶ BTUX 1.7 x10⁶/HR X 5840 HRS	14892	
ELECTRICITY,	$.03/KWH X 5840 HRS X .746 KW/HP X 32.9 HP.	4300	
DIRECT LABOR:	.5 HRS/SHIFT X 730 SHIFTS/YR X 8.00/HR	2920	—
SUPPLIES:			
MAINTENANCE BUILDING OVERHEAD TAXES & INSURANCE INTREST & DEPRECIATION	USE 25% OF CAPITAL COSTS .25 X $ 142,470.	35,685	—
SECONDARY RECOVERY	$1.50/10⁶ BTU X 1.9 x10⁶/HR X 5840 HRS SAVINGS	-16,644	
	TOTAL OPERATING COST	41153	

OPERATING COST ESTIMATE

UNIT SIZE 5000 SCFM 25 % LEL PROCESS TEMP. 300°F

CONTROL EQUIPTMENT DESCRIPTION

THERMAL INCINERATOR - CASE III FUME INCINERATOR WITH PRIMARY & SECONDARY HEAT EXCHANGERS NO CATALYST

PROCESS OPERATING TIME - 2 SHIFTS/DAY - 365 DAYS/YR = 5,840 HRS

ITEM	DESCRIPTION	COST ($/YR)
UTILITIES: WATER, STEAM, #2 FUEL OIL, ELECTRICITY,	$1.50/10⁶ BTU X .45 X10⁶/HR X 5840 HRS	3942
	$.03/KWH X 5840 HRS X .746 KW/HP X 32.9 HP.	4300
DIRECT LABOR:	.5 HRS/SHIFT X 730 SHIFTS/YR X 8.00/HR	2920
SUPPLIES:		
MAINTENANCE, BUILDING OVERHEAD, TAXES & INSURANCE, INTEREST & DEPRECIATION	USE 25% OF CAPITAL COSTS .25 X $ 148,470	37,118
SECONDARY RECOVERY	$1.50/10⁶ BTU X 1.9 X10⁶/HR X 5840 HRS SAVINGS	- 16,644
	TOTAL OPERATING COST	31,636

OPERATING COST ESTIMATE

UNIT SIZE 15,000 SCFM 0 % LEL PROCESS TEMP. 300°F

CONTROL EQUIPTMENT DESCRIPTION

THERMAL INCINERATOR - CASE III FUME INCINERATOR

WITH PRIMARY & SECONDARY HEAT EXCHANGERS

NO CATALYST

PROCESS OPERATING TIME - 2 SHIFTS/DAY - 365 DAYS/YR = 5,840 HRS

ITEM	DESCRIPTION	COST ($/YR)	
UTILITIES:			
WATER,			
STEAM,			
#2 FUEL OIL,	$1.50/10⁶ BTU x 13.6 x10⁶/HR. x 5840 HRS	119136	
ELECTRICITY,	$.03/KWH x 5840 HRS x .746 KW/HP x 102.6 HP.	13410	
DIRECT LABOR:	.5 HRS/SHIFT x 730 SHIFTS/YR x 8.00/ HR	2920	—
SUPPLIES:			
MAINTENANCE BUILDING OVERHEAD TAXES & INSURANCE INTEREST & DEPRECIATION	USE 25% OF CAPITAL COSTS .25 x $ 182,765	45691	
SECONDARY RECOVERY	$1.50/10⁶ BTU x 5.7 x10⁶/HR x 5840 HRS SAVINGS	-49,932	—
	TOTAL OPERATING COST	131225	

OPERATING COST ESTIMATE

UNIT SIZE 15,000 SCFM 5 % LEL PROCESS TEMP. 300°F

CONTROL EQUIPTMENT DESCRIPTION

THERMAL INCINERATOR - CASE III FUME INCINERATOR

WITH PRIMARY & SECONDARY HEAT EXCHANGERS

NO CATALYST

PROCESS OPERATING TIME - 2 SHIFTS/DAY - 365 DAYS/YR = 5,840 HRS

ITEM	DESCRIPTION	COST ($/YR)
UTILITIES:		
WATER,		
STEAM,		
#2 FUEL OIL,	$1.50/10⁶ BTU x 10.7 x10⁶/HR x 5840 HRS	93732
ELECTRICITY,	$.03/KWH x 5840 HRS x .746 KW/HP x 102.6 HP.	13410
DIRECT LABOR:	.5 HRS/SHIFT x 730 SHIFTS/YR x 8.00/HR	2920 —
SUPPLIES:		
MAINTENANCE BUILDING OVERHEAD TAXES & INSURANCE INTEREST & DEPRECIATION	USE 25% OF CAPITAL COSTS .25 x $ 182,765	45,691 —
SECONDARY RECOVERY	$1.50/10⁶ BTU x 5.7 x10⁶/HR x 5840 HRS SAVINGS —	49,932
	TOTAL OPERATING COST	105821

: OPERATING COST ESTIMATE

UNIT SIZE 15,000 SCFM 15 % LEL PROCESS TEMP. 300°F

CONTROL EQUIPTMENT DESCRIPTION

THERMAL INCINERATOR - CASE III FUME INCINERATOR

WITH PRIMARY & SECONDARY HEAT EXCHANGERS

NO CATALYST

PROCESS OPERATING TIME - 2 SHIFTS/DAY - 365 DAYS/YR. = 5,840 HRS

ITEM	DESCRIPTION	COST ($/YR)	
UTILITIES:			
WATER,			
STEAM,			
#2 FUEL OIL,	$1.50/10⁶ BTU × 5.0 × 10⁶/HR × 5840 HRS	43800	
ELECTRICITY,	$.03/KWH × 5840 HRS × .746 KW/HP × 102.6 HP.	13410	
DIRECT LABOR:	.5 HRS/SHIFT × 730 SHIFTS/YR × 8.00/HR	2920	—
SUPPLIES:			
MAINTENANCE BUILDING OVERHEAD TAXES & INSURANCE INTREST & DEPRECIATION	USE 25% OF CAPITAL COSTS .25 × $ 182,765	45691	—
SECONDARY RECOVERY	$1.50/10⁶ BTU × 5.7 × 10⁶/HR × 5840 HRS SAVINGS	−49,932	—
	TOTAL OPERATING COST	55889	

OPERATING COST ESTIMATE

UNIT SIZE 15,000 SCFM 25 % LEL PROCESS TEMP. 300°F

CONTROL EQUIPTMENT DESCRIPTION

THERMAL INCINERATOR - CASE III FUME INCINERATOR WITH PRIMARY & SECONDARY HEAT EXCHANGERS NO CATALYST

PROCESS OPERATING TIME - 2 SHIFTS/DAY - 365 DAYS/YR = 5,840 HRS

ITEM	DESCRIPTION	COST ($/YR)	
UTILITIES: WATER, STEAM, #2 FUEL OIL,	$1.50/10⁶ BTU × 1.4 ×10⁶/HR × 5840 HRS	12,264	
ELECTRICITY,	$.03/KWH × 5840 HRS × .746 KW/HP × 102.6 HP.	13410	
DIRECT LABOR:	.5 HRS/SHIFT × 730 SHIFTS/YR × 8.00/HR	2920	—
SUPPLIES:			
MAINTENANCE, BUILDING OVERHEAD, TAXES & INSURANCE, INTEREST & DEPRECIATION	USE 25% OF CAPITAL COSTS .25 × $ 190,265	47,566	-
SECONDARY RECOVERY	$1.50/10⁶ BTU × 5.7 ×10⁶/HR × 5840 HRS SAVINGS	− 49,932	
	TOTAL OPERATING COST	26,228	

OPERATING COST ESTIMATE

UNIT SIZE 30,000 SCFM 0 % LEL PROCESS TEMP. 300°F

CONTROL EQUIPTMENT DESCRIPTION

THERMAL INCINERATOR - CASE III FUME INCINERATOR WITH PRIMARY & SECONDARY HEAT EXCHANGERS NO CATALYST

PROCESS OPERATING TIME - 2 SHIFTS/DAY - 365 DAYS/YR = 5,840 HRS

ITEM	DESCRIPTION	COST ($/YR)	
UTILITIES: WATER, STEAM, #2 FUEL OIL, ELECTRICITY,	$1.50/10⁶ BTU x 26.9 x 10⁶/HR x 5840 HRS	235644	
	$.03/KWH x 5840 HRS x .746 KW/HP x 266 HP.	34766	
DIRECT LABOR:	.5 HRS/SHIFT x 730 SHIFTS/YR x 8.00/HR	2920	—
SUPPLIES:			
MAINTENANCE, BUILDING OVERHEAD, TAXES & INSURANCE, INTEREST & DEPRECIATION	USE 25% OF CAPITAL COSTS .25 x $ 230,440	57,610	—
SECONDARY RECOVERY	$1.50/10⁶ BTU x 11.3 x 10⁶/HR x 5840 HRS SAVINGS	98,988	-
	TOTAL OPERATING COST	231952	

OPERATING COST ESTIMATE

UNIT SIZE 30,000 SCFM 5 % LEL PROCESS TEMP. 300°F

CONTROL EQUIPTMENT DESCRIPTION

THERMAL INCINERATOR - CASE III FUME INCINERATOR WITH PRIMARY & SECONDARY HEAT EXCHANGERS NO CATALYST

PROCESS OPERATING TIME - 2 SHIFTS/DAY - 365 DAYS/YR = 5,840 HRS

ITEM	DESCRIPTION	COST ($/YR)	
UTILITIES:			
WATER,			
STEAM,			
#2 FUEL OIL,	$1.50/10⁶ BTU X 21.3 X10⁶/HR X 5840 HRS	186588	
ELECTRICITY,	$.03/KWH X 5840 HRS X .746 KW/HP X 266 HP.	34766	
DIRECT LABOR:	.5 HRS/SHIFT X 730 SHIFTS/YR X 8.00/ HR	2920	—
SUPPLIES:			
MAINTENANCE BUILDING OVERHEAD TAXES & INSURANCE INTEREST & DEPRECIATION	USE 25% OF CAPITAL COSTS .25 X $ 230,440	57,610	—
SECONDARY RECOVERY	$1.50/10⁶ BTU X 11.3 X10⁶/HR X 5840 HRS SAVINGS	- 98,988	—
	TOTAL OPERATING COST	182896	

OPERATING COST ESTIMATE

UNIT SIZE 30,000 SCFM 15 % LEL PROCESS TEMP. 300°F

CONTROL EQUIPTMENT DESCRIPTION

THERMAL INCINERATOR - CASE III FUME INCINERATOR

WITH PRIMARY & SECONDARY HEAT EXCHANGERS

NO CATALYST

PROCESS OPERATING TIME - 2 SHIFTS/DAY - 365 DAYS/YR = 5,840 HRS

ITEM	DESCRIPTION	COST ($/YR)
UTILITIES:		
WATER,		
STEAM,		
#2 FUEL OIL,	$1.50/10^6 BTU x 10.0 x 10^6/HR x 5840 HRS	87600
ELECTRICITY,	$.03/KWH x 5840 HRS x .746 KW/HP x 266 HP.	34766
DIRECT LABOR:	.5 HRS/SHIFT x 730 SHIFTS/YR x 8.00/HR	2920 —
SUPPLIES:		
MAINTENANCE BUILDING OVERHEAD TAXES & INSURANCE INTEREST & DEPRECIATION	USE 25% OF CAPITAL COSTS .25 x $ 230,440	57,610 —
SECONDARY RECOVERY	$1.50/10^6 BTU x 11.3 x 10^6/HR x 5840 HRS SAVINGS	98,988 —
	TOTAL OPERATING COST	83908

OPERATING COST ESTIMATE

UNIT SIZE 30,000 SCFM 25 % LEL PROCESS TEMP. 300°F

CONTROL EQUIPTMENT DESCRIPTION

THERMAL INCINERATOR - CASE III FUME INCINERATOR WITH PRIMARY & SECONDARY HEAT EXCHANGERS NO CATALYST

PROCESS OPERATING TIME - 2 SHIFTS/DAY - 365 DAYS/YR = 5,840 HRS

ITEM	DESCRIPTION	COST ($/YR)	
UTILITIES:			
WATER,			
STEAM,			
#2 FUEL OIL,	$1.50/10⁶ BTU × 2.7 × 10⁶/HR × 5840 HRS	23,652	
ELECTRICITY,	$.03/KWH × 5840 HRS × .746 KW/HP × 266 HP.	34766	
DIRECT LABOR:	.5 HRS/SHIFT × 730 SHIFTS/YR × 8.00/HR	2920	—
SUPPLIES:			
MAINTENANCE BUILDING OVERHEAD TAXES & INSURANCE INTEREST & DEPRECIATION	USE 25% OF CAPITAL COSTS .25 × $ 238,940	59,735	—
SECONDARY RECOVERY	$1.50/10⁶ BTU × 11.3 × 10⁶/HR × 5840 HRS SAVINGS	98988	—
	TOTAL OPERATING COST	22085	—

Operating Cost Estimate

Unit Size 5000 SCFM 0 % LEL Process Temp. 70°F

Control Equipment Description

Thermal Incinerator - Case III Fume Incinerator with Primary & Secondary Heat Exchangers & Catalyst Bed

Process Operating Time - 2 shifts/day - 365 days/yr = 5,840 hrs

Item	Description	Cost ($/yr)	
Utilities:			
Water,			
Steam,			
#2 Fuel Oil,	$1.50/10⁶ BTU x 2.0 x 10⁶/hr x 5840 hrs	17,520	—
Electricity,	$.03/KWH x 5840 hrs x .746 KW/HP x 15.8 HP.	2065	—
Catalyst Replacement	.0.4141 x $14,500. (3 yrs life)	6005	—
Direct Labor:	.5 hrs/shift x 730 shifts/yr x 8.00/hr	2920	—
Supplies:			
Maintenance, Building Overhead, Taxes & Insurance, Interest & Depreciation	Use 25% of Capital Costs .25 x $ 110,130	27533	
Secondary Recovery	1.50/10⁶ BTU x 0.7 x 10⁶/hr x 5840 hrs Savings	− 6132	
	Total Operating Cost	49,911	

Operating Cost Estimate

Unit Size 5000 SCFM 5 % LEL Process Temp. 70°F

Control Equipment Description

Thermal Incinerator - Case III Fume Incinerator with Primary & Secondary Heat Exchangers & Catalyst Bed

Process Operating Time - 2 shifts/day - 365 days/yr = 5,840 hrs

Item	Description	Cost ($/yr)	
Utilities:			
Water,			
Steam,			
#2 Fuel Oil,	$1.50/10⁶ BTU x 1.7 x 10⁶/hr x 5840 hrs	14,892	—
Electricity,	$.03/KWH x 5840 hrs x .746 KW/HP x 15.8 HP.	2065	—
Catalyst Replacement	.0.4141 x $14,500. (3 yrs life)	6005	—
Direct Labor:	.5 hrs/shift x 730 shifts/yr x 8.00/hr	2920	—
Supplies:			
Maintenance, Building Overhead, Taxes & Insurance, Interest & Depreciation	Use 25% of capital costs .25 x $ 110,130	27533	—
Secondary Recovery	1.50/10⁶ BTU x 0.8 x 10⁶/hr x 5840 hrs savings	− 7008	
	Total Operating Cost	46407	

Operating Cost Estimate

Unit Size 5000 SCFM 15 % LEL Process Temp. 70°F

Control Equipment Description

Thermal Incinerator - Case III Fume Incinerator with Primary & Secondary Heat Exchangers & Catalyst Bed

Process Operating Time - 2 shifts/day - 365 days/yr = 5,840 hrs

Item	Description	Cost ($/yr)	
Utilities:			
Water,			
Steam,			
#2 Fuel Oil,	$1.50/10⁶ BTU x 1.2 x 10⁶/hr x 5840 hrs	10512	
Electricity,	$.03/KWH x 5840 hrs x .746 KW/HP x 15.8 HP.	2765	—
Catalyst Replacement	.0.4141 x $14,500. (3 yrs life)	6005	—
Direct Labor:	.5 hrs/shift x 730 shifts/yr x 8.00/hr	2920	—
Supplies:			
Maintenance Building Overhead Taxes & Insurance Interest & Depreciation	Use 25% of capital costs .25 x $ 140690	35173	—
Secondary Recovery	1.50/10⁶ BTU x 1.2 x 10⁶/hr x 5840 hrs savings	-10,512	
	Total Operating Cost	46163	

Operating Cost Estimate

Unit Size 5000 SCFM 25 % LEL Process Temp. 70°F

Control Equipment Description

Thermal Incinerator - Case III Fume Incinerator with Primary & Secondary Heat Exchangers & Catalyst Bed

Process Operating Time - 2 shifts/day - 365 days/yr = 5,840 hrs

Item	Description	Cost ($/yr)	
Utilities:			
Water,			
Steam,			
#2 Fuel Oil,	$1.50/10⁶ BTU .2 x 10⁶/hr x 5840 hrs	1756	—
Electricity,	$.03/KWH x 5840 hrs x .746 KW/HP x 18.0 HP.	2352	—
Catalyst Replacement	.0.4141 X [illegible] 500. (3 yrs life)	6005	—
Direct Labor:	.5 hrs/shift x 730 shifts/yr x 8.00/hr	2920	—
Supplies:			
Maintenance Building Overhead Taxes & Insurance Interest & Depreciation	Use 25% of capital costs .25 x $ 140690	35173	
Secondary Recovery	1.50/10⁶ BTU .4 x 10⁶/hr x 5840 hrs savings	-12,264	
	Total Operating Cost	35,942	

OPERATING COST ESTIMATE

UNIT SIZE 15,000 SCFM 0 % LEL PROCESS TEMP. 70°F

CONTROL EQUIPTMENT DESCRIPTION

THERMAL INCINERATOR - CASE III FUME INCINERATOR WITH PRIMARY & SECONDARY HEAT EXCHANGERS & CATALYST BED

PROCESS OPERATING TIME - 2 SHIFTS/DAY - 365 DAYS/YR = 5,840 HRS

ITEM	DESCRIPTION	COST ($/YR)	
UTILITIES:			
WATER,			
STEAM,			
#2 FUEL OIL,	$1.50/10⁶ BTU × 6.1 × 10⁶/HR × 5840 HRS	53436	
ELECTRICITY,	$.03/KWH × 5840 HRS × .746 KW/HP × 50.0 HP.	6535	
CATALYST REPLACEMT	.0.4141 × $43,500. (3 YRS LIFE)	18014	—
DIRECT LABOR:	.5 HRS/SHIFT × 730 SHIFTS/YR × 8.00/HR	2920	—
SUPPLIES:			
MAINTENANCE BUILDING OVERHEAD TAXES & INSURANCE INTEREST & DEPRECIATION	USE 25% OF CAPITAL COSTS .25 × $ 187500	46875	
SECONDARY RECOVERY	1.50/10⁶ BTU × 2.0 × 10⁶/HR × 5840 HRS SAVINGS	−17520	
	TOTAL OPERATING COST	110260	

OPERATING COST ESTIMATE

UNIT SIZE 15,000 SCFM 5 % LEL PROCESS TEMP. 70°F

CONTROL EQUIPTMENT DESCRIPTION

THERMAL INCINERATOR - CASE III FUME INCINERATOR WITH PRIMARY & SECONDARY HEAT EXCHANGERS & CATALYST BED

PROCESS OPERATING TIME - 2 SHIFTS/DAY - 365 DAYS/YR = 5,840 HRS

ITEM	DESCRIPTION	COST ($/YR)
UTILITIES:		
WATER,		
STEAM,		
#2 FUEL OIL,	$1.50/10⁶ BTU X 5.0 X 10⁶/HR X 5840 HRS	43800
ELECTRICITY,	$.03/KWH X 5840 HRS X .746 KW/HP X 50.0 HP.	6535
CATALYST REPLACEMT	.0.4141 X $43,500. (3 YRS LIFE)	18014 —
DIRECT LABOR:	.5 HRS/SHIFT X 730 SHIFTS/YR X 8.00/HR	2920 —
SUPPLIES:		
MAINTENANCE, BUILDING OVERHEAD, TAXES & INSURANCE, INTREST & DEPRECIATION	USE 25% OF CAPITAL COSTS .25 X $ 187500	46875
SECONDARY RECOVERY	1.50/10⁶ BTU X 2.5 X 10⁶/HR X 5840 HRS SAVINGS	-21900
	TOTAL OPERATING COST	96244

OPERATING COST ESTIMATE

UNIT SIZE 15,000 SCFM 15 % LEL PROCESS TEMP. 70°F

CONTROL EQUIPTMENT DESCRIPTION

THERMAL INCINERATOR - CASE III FUME INCINERATOR WITH PRIMARY & SECONDARY HEAT EXCHANGERS & CATALYST BED

PROCESS OPERATING TIME - 2 SHIFTS/DAY - 365 DAYS/YR = 5,840 HRS

ITEM	DESCRIPTION	COST ($/YR)
UTILITIES:		
WATER,		
STEAM,		
#2 FUEL OIL,	$1.50/10⁶ BTU :: 3.5 x 10⁶/HR x 5840 HRS	30660
ELECTRICITY,	$.03/KWH x 5840 HRS x .746 KW/HP x 50.0 HP.	6535
CATALYST REPLACEMENT	.0.4141 X 43,500. (3 YRS LIFE)	18014 —
DIRECT LABOR:	.5 HRS/SHIFT x 730 SHIFTS/YR x 8.00/HR	2920 —
SUPPLIES:		
MAINTENANCE BUILDING OVERHEAD TAXES & INSURANCE INTEREST & DEPRECIATION	USE 25% OF CAPITAL COSTS .25 x $ 221580	55395
SECONDARY RECOVERY	1.50/10⁶ BTU :: 3.5 x 10⁶/HR x 5840 HRS SAVINGS	— 30660
	TOTAL OPERATING COST	82864

Operating Cost Estimate

Unit Size 15,000 SCFM 25% LEL Process Temp. 70°F

Control Equipment Description

Thermal Incinerator - Case III Fume Incinerator with Primary & Secondary Heat Exchangers & Catalyst Bed

Process Operating Time - 2 shifts/day - 365 days/yr = 5,840 hrs

Item	Description	Cost ($/yr)
Utilities:		
Water,		
Steam,		
#2 Fuel Oil,	$1.50/10⁶ BTU x .61 x 10⁶/hr x 5840 hrs	5344
Electricity,	$.03/KWH x 5840 hrs x .746 KW/HP x 55.6 HP.	7267
Catalyst Replacement	.0.4141 x $43,500. (3 yrs life)	18014 —
Direct Labor:	.5 hrs/shift x 730 shifts/yr x 8.00/hr	2920 —
Supplies:		
Maintenance	Use 25% of capital costs	
Building Overhead		
Taxes & Insurance	.25 x $221580	55395
Interest & Depreciation		
Secondary Recovery	1.50/10⁶ BTU x 4.3 x 10⁶/hr x 5840 hrs savings	−37668
	Total Operating Cost	51,272 −

OPERATING COST ESTIMATE

UNIT SIZE 30,000 SCFM 0 % LEL PROCESS TEMP. 70°F

CONTROL EQUIPTMENT DESCRIPTION

THERMAL INCINERATOR - CASE III FUME INCINERATOR WITH PRIMARY & SECONDARY HEAT EXCHANGERS & CATALYST BED

PROCESS OPERATING TIME - 2 SHIFTS/DAY - 365 DAYS/YR = 5,840 HRS

ITEM	DESCRIPTION	COST ($/YR)	
UTILITIES:			
WATER,			
STEAM,			
#2 FUEL OIL,	$1.50/10⁶ BTU: 12.2 x 10⁶/HR x 5840 HRS	106872	
ELECTRICITY,	$.03/KWH x 5840 HRS x .746 KW/HP x 122.3 HP.	15985	
CATALYST REPLACEMT	.0.4141 x $ 87,000. (3 YRS LIFE)	36,027	—
DIRECT LABOR:	.5 HRS/SHIFT x 730 SHIFTS/YR x 8.00/HR	2920	—
SUPPLIES:			
MAINTENANCE BUILDING OVERHEAD TAXES & INSURANCE INTREST & DEPRECIATION	USE 25% OF CAPITAL COSTS .25 x $ 284105	71026	
SECONDARY RECOVERY	1.50/10⁶ BTU x .0 x 10⁶/HR x 5840 HRS SAVINGS	-35040	
	TOTAL OPERATING COST	197,790	

Operating Cost Estimate

Unit Size 30,000 SCFM 5 % LEL Process Temp. 70°F

Control Equipment Description

Thermal Incinerator - Case III Fume Incinerator with Primary & Secondary Heat Exchangers & Catalyst Bed

Process Operating Time - 2 shifts/day - 365 days/yr. = 5,840 hrs

Item	Description	Cost ($/yr)
Utilities:		
Water, Steam, #2 Fuel Oil,	$1.50/10⁶ BTU × 10.4 × 10⁶/hr × 5840 hrs	91104
Electricity,	$.03/KWH × 5840 hrs × .746 KW/HP × 122.3 HP.	15985
Catalyst Replacement	.0.4141 × $87,000. (3 yrs life)	36,027
Direct Labor:	.5 hrs/shift × 730 shifts/yr × 8.00/hr	2920
Supplies:		
Maintenance, Building Overhead, Taxes & Insurance, Interest & Depreciation	Use 25% of capital costs .25 × $284105	71026
Secondary Recovery	1.50/10⁶ BTU × 5.0 × 10⁶/hr × 5840 hrs savings	−43800
	Total Operating Cost	173262

OPERATING COST ESTIMATE

UNIT SIZE 30,000 SCFFM 15 % LEL PROCESS TEMP. 70°F

CONTROL EQUIPTMENT DESCRIPTION

THERMAL INCINERATOR CASE III FUME INCINERATOR WITH PRIMARY & SECONDARY HEAT EXCHANGERS & CATALYST BED

PROCESS OPERATING TIME - SHIFTS/DAY - 365 DAYS/YR = 5,840 HRS

ITEM	DESCRIPTION	COST ($/YR)
UTILITIES:		
WATER,		
STEAM,		
#2 FUEL OIL,	$1.50/10⁶ BTU's .1 x 10⁶/HR x 5840 HRS	62196
ELECTRICITY,	$.03/KWH x 5840 HRS x .746 KW/HP x 122.3 HP.	15985
CATALYST REPLACEMT	.0.4141 X $ 87,000. (3 YRS LIFE)	36,027 —
DIRECT LABOR:	.5 HRS/SHIFT ; 730 SHIFTS/YR x 8.00/HR	2920 —
SUPPLIES.		
MAINTENANCE BUILDING OVERHEAD TAXES & INSURANCE INTEREST & DEPRECIATION	USE 25% OF CAPITAL COSTS .25 : $ 323045	80761
SECONDARY RECOVERY	1.50/10⁶ BTU x .1 : x 10⁶/HR x 5840 HRS SAVINGS	-61320
	TOTAL OPERATING COST	136569

Operating Cost Estimate

Unit Size 30,000 SCFM 25 % LEL Process Temp. 70°F

Control Equipment Description

Thermal Incinerator - Case III Fume Incinerator With Primary & Secondary Heat Exchangers & Catalyst Bed

Process Operating Time - 2 shifts/day - 365 days/yr = 5,840 hrs

Item	Description	Cost ($/yr)	
Utilities:			
Water,			
Steam,			
#2 Fuel Oil,	$1.50/10⁶ BTU x 1.22 x 10⁶/hr x 5840 hrs	10,682	
Electricity,	$.03/KWH x 5840 hrs x .746 KW/HP x 132.7 HP.	17344	
Catalyst Replacement	.0.4141 x $87,000. (3 yrs life)	36,027	—
Direct Labor:	.5 hrs/shift x 730 shifts/yr x 8.00/hr	2920	—
Supplies:			
Maintenance Building Overhead Taxes & Insurance Interest & Depreciation	Use 25% of capital costs .25 x $ 323045	80761	
Secondary Recovery	1.50/10⁶ BTU x 8.5 x 10⁶/hr x 5840 hrs Savings	− 74460	
	Total Operating Cost	73,274	

OPERATING COST ESTIMATE

UNIT SIZE 5000 SCFM 0 % LEL PROCESS TEMP. 300°F

CONTROL EQUIPTMENT DESCRIPTION

THERMAL INCINERATOR - CASE III FUME INCINERATOR WITH PRIMARY & SECONDARY HEAT EXCHANGERS & CATALYST BED

PROCESS OPERATING TIME - 2 SHIFTS/DAY - 365 DAYS/YR = 5,840 HRS

ITEM	DESCRIPTION	COST ($/YR)
UTILITIES:		
WATER,		
STEAM,		
#2 FUEL OIL,	$1.50/10^6 BTU \times 1.2 \times 10^6/HR \times 5840 HRS$	10512
ELECTRICITY,	$.03/KWH \times 5840 HRS \times .746 KW/HP \times 32.4 HP.$	4235
CATALYST REPLACEMENT	$.0.4141 \times \$14,500.$ (3 YRS LIFE)	6005 —
DIRECT LABOR:	.5 HRS/SHIFT X 730 SHIFTS/YR X 8.20/HR	2920 —
SUPPLIES:		
MAINTENANCE BUILDING OVERHEAD TAXES & INSURANCE INTREST & DEPRECIATION	USE 25% OF CAPITAL COSTS .25 X $110130	27533
SECONDARY RECOVERY	$1.50/10^6 BTU \times 2.8 \times 10^6/HR \times 5840 HRS$ SAVINGS	-7008
	TOTAL OPERATING COST	44197

OPERATING COST ESTIMATE

UNIT SIZE 5000 SCFM 5 % LEL PROCESS TEMP. 300°F

CONTROL EQUIPTMENT DESCRIPTION

THERMAL INCINERATOR - CASE III FUME INCINERATOR WITH PRIMARY & SECONDARY HEAT EXCHANGERS & CATALYST BED

PROCESS OPERATING TIME - 2 SHIFTS/DAY - 365 DAYS/YR = 5,840 HRS

ITEM	DESCRIPTION	COST ($/YR)	
UTILITIES:			
WATER,			
STEAM,			
#2 FUEL OIL,	$1.50/10⁶ BTU × 0.8 × 10⁶/HR × 5840 HRS	7008	
ELECTRICITY,	$.03/KWH × 5840 HRS × .746 KW/HP × 32.4 HP.	4235	
CATALYST REPLACEMT	.0.4141 × $14,500. (3 YRS LIFE)	6005	—
DIRECT LABOR:	.5 HRS/SHIFT × 730 SHIFTS/YR × 8.00/HR	2920	—
SUPPLIES:			
MAINTENANCE BUILDING OVERHEAD TAXES & INSURANCE INTEREST & DEPRECIATION	USE 25% OF CAPITAL COSTS .25 × $ 110130	27533	
SECONDARY RECOVERY	1.50/10⁶ BTU × 1.0 × 10⁶/HR × 5840 HRS SAVINGS	— 8760	
	TOTAL OPERATING COST	38941	

OPERATING COST ESTIMATE

UNIT SIZE 5000 SCFM 15 % LEL PROCESS TEMP. 300°F

CONTROL EQUIPMENT DESCRIPTION

THERMAL INCINERATOR - CASE III FUME INCINERATOR WITH PRIMARY & SECONDARY HEAT EXCHANGERS & CATALYST BED

PROCESS OPERATING TIME - 2 SHIFTS/DAY - 365 DAYS/YR = 5,840 HRS

ITEM	DESCRIPTION	COST ($/YR)
UTILITIES:		
WATER,		
STEAM,		
#2 FUEL OIL,	$1.50/10⁶ BTU × 0.3 × 10⁶/HR × 5840 HRS	2628
ELECTRICITY,	$.03/KWH × 5840 HRS × .746 KW/HP × 32.4 HP.	4235
CATALYST REPLACEMENT	.0.4141 × $14,500. (3 YRS LIFE)	6005 —
DIRECT LABOR:	.5 HRS/SHIFT × 730 SHIFTS/YR × 8.00/HR	2920 —
SUPPLIES:		
MAINTENANCE BUILDING OVERHEAD TAXES & INSURANCE INTEREST & DEPRECIATION	USE 25% OF CAPITAL COSTS .25 × $ 140690	35173
SECONDARY RECOVERY	1.50/10⁶ BTU × 1.3 × 10⁶/HR × 5840 HRS SAVINGS	− 11388
	TOTAL OPERATING COST	39573

OPERATING COST ESTIMATE

UNIT SIZE 5000 SCFM 25 % LEL PROCESS TEMP. 300°F

CONTROL EQUIPTMENT DESCRIPTION

THERMAL INCINERATOR - CASE III FUME INCINERATOR WITH PRIMARY & SECONDARY HEAT EXCHANGERS & CATALYST BED

PROCESS OPERATING TIME - 2 SHIFTS/DAY - 365 DAYS/YR = 5,840 HRS

ITEM	DESCRIPTION	COST ($/YR)	
UTILITIES:			
WATER,			
STEAM,			
#2 FUEL OIL,	$1.50/10⁶ BTU X — X 10⁶/H[illegible] [illegible] HRS	-	
ELECTRICITY,	$.03/KWH X 5840 HRS X [illegible] X ____ HP.	-	
CATALYST REPLACEMENT	.0.4141 X $14,50[illegible] ([illegible]S LIFE)	6005	—
DIRECT LABOR:	.5 HRS/SHIFT X 7[illegible] [illegible]/YR X 8.00/HR	2920	—
SUPPLIES:			
MAINTENANCE BUILDING OVERHEAD TAXES & INSURANCE INTREST & DEPRECIATION	% OF CAPITAL COSTS X $ 140690	35173	
	OPERATION AT ABOVE DESIGN CONDITIONS NOT RECOMMENDED		
SECONDARY RECOVERY	1.50/10⁶ BTU X X 10⁶/HR X 5840 HRS SAVINGS	—	
	TOTAL OPERATING COST		

OPERATION AT ABOVE DESIGN CONDITIONS NOT RECOMMENDED

OPERATING COST ESTIMATE

UNIT SIZE 15,000 SCFM 0 % LEL PROCESS TEMP. 300°F

CONTROL EQUIPTMENT DESCRIPTION

THERMAL INCINERATOR - CASE III FUME INCINERATOR WITH PRIMARY & SECONDARY HEAT EXCHANGERS & CATALYST BED

PROCESS OPERATING TIME - 2 SHIFTS/DAY - 365 DAYS/YR = 5,840 HRS

ITEM	DESCRIPTION	COST ($/YR)	
UTILITIES:			
WATER,			
STEAM,			
#2 FUEL OIL,	$1.50/$10^6$ BTU X 3.6 X 10^6/HR X 5840 HRS	31536	
ELECTRICITY,	$.03/KWH X 5840 HRS X .746 KW/HP X 99.6 HP.	13018	
CATALYST REPLACEMT	.0.4141 X $43,500. (3 YRS LIFE)	18,014	—
DIRECT LABOR:	.5 HRS/SHIFT X 730 SHIFTS/YR X 8.00/HR	2920	—
SUPPLIES:			
MAINTENANCE BUILDING OVERHEAD TAXES & INSURANCE INTEREST & DEPRECIATION	USE 25% OF CAPITAL COSTS .25 X $ 187500	46875	
SECONDARY RECOVERY	1.50/10^6 BTU X 2.5 X 10^6/HR X 5840 HRS SAVINGS	-21900	
	TOTAL OPERATING COST	90463	

OPERATING COST ESTIMATE

UNIT SIZE 15,000 SCFM 5% LEL PROCESS TEMP. 300°F

CONTROL EQUIPTMENT DESCRIPTION

THERMAL INCINERATOR - CASE III FUME INCINERATOR WITH PRIMARY & SECONDARY HEAT EXCHANGERS & CATALYST BED

PROCESS OPERATING TIME - 2 SHIFTS/DAY - 365 DAYS/YR = 5,840 HRS

ITEM	DESCRIPTION	COST ($/YR)	
UTILITIES:			
WATER,			
STEAM,			
#2 FUEL OIL,	$1.50/10⁶ BTU: 2.5 x 10⁶/HR x 5840 HRS	21900	
ELECTRICITY,	$.03/KWH x 5840 HRS x .746 KW/HP x 99.6 HP.	13018	
CATALYST REPLACEMT	.0.4141 x $ 43,500. (3 YRS LIFE)	18,014	—
DIRECT LABOR:	.5 HRS/SHIFT x 730 SHIFTS/YR x 8.00/HR	2920	—
SUPPLIES:			
MAINTENANCE BUILDING OVERHEAD TAXES & INSURANCE INTEREST & DEPRECIATION	USE 25% OF CAPITAL COSTS .25 x $ 187500	46875	
SECONDARY RECOVERY	1.50/10⁶ BTU x 3.0 x 10⁶/HR x 5840 HRS SAVINGS	-26280	
	TOTAL OPERATING COST	76447	

OPERATING COST ESTIMATE

UNIT SIZE 15,000 SCFM 15% LEL PROCESS TEMP. 300°F

CONTROL EQUIPTMENT DESCRIPTION

THERMAL INCINERATOR - CASE III FUME INCINERATOR WITH PRIMARY & SECONDARY HEAT EXCHANGERS & CATALYST BED

PROCESS OPERATING TIME - 2 SHIFTS/DAY - 365 DAYS/YR = 5,840 HRS

ITEM	DESCRIPTION	COST ($/YR)
UTILITIES:		
WATER,		
STEAM,		
#2 FUEL OIL,	$1.50/10⁶ BTUX 0.8 x10⁶/HR X 5840 HRS	7008
ELECTRICITY,	$.03/KWH X 5840 HRS X .746 KW/HP X 99.6 HP.	13018
CATALYST REPLACEMT	.0.4141 X 43,500. (3 YRS LIFE)	18,014
DIRECT LABOR:	.5 HRS/SHIFT X 730 SHIFTS/YR X 8.00/HR	2920
SUPPLIES:		
MAINTENANCE BUILDING OVERHEAD TAXES & INSURANCE INTEREST & DEPRECIATION	USE 25% OF CAPITAL COSTS .25 X $ 221580	55395
SECONDARY RECOVERY	1.50/10⁶ BTU X 4.0 X10⁶/HR X 5840 HRS SAVINGS	-35040
	TOTAL OPERATING COST	61315

OPERATING COST ESTIMATE

UNIT SIZE 15,000 SCFM 25% LEL PROCESS TEMP. 300°F

CONTROL EQUIPTMENT DESCRIPTION

THERMAL INCINERATOR - CASE III FUME INCINERATOR WITH PRIMARY & SECONDARY HEAT EXCHANGERS & CATALYST BED

PROCESS OPERATING TIME - 2 SHIFTS/DAY - 365 DAYS/YR = 5,840 HRS

ITEM	DESCRIPTION	COST ($/YR)	
UTILITIES:			
WATER,			
STEAM,			
#2 FUEL OIL,	$1.50/10⁶ BTU x _____ x 10⁶/HR [illegible] HRS	—	
ELECTRICITY,	$.03/KWH x 5840 HRS x [illegible] x ____ HP.	—	
CATALYST REPLACEMENT	.0.4141 X [illegible] 43,500. [illegible] LIFE)	18,014	—
DIRECT LABOR:	.5 HRS/SHIFT [illegible] /YR x 8.00/HR	2920	—
SUPPLIES:			
MAINTENANCE	OPERATION [illegible] % OF CAPITAL COSTS		
BUILDING OVERHEAD			
TAXES & INSURANCE	$ 221580	55395	
INTEREST & DEPRECIATION			
	OPERATION AT ABOVE DESIGN CONDITIONS NOT RECOMMENDED		
SECONDARY RECOVERY	1.50/10⁶ BTU x x 10⁶/HR x 5840 HRS SAVINGS	—	
	TOTAL OPERATING COST		

ABOVE DESIGN CONDITIONS RECOMMENDED

OPERATING COST ESTIMATE

UNIT SIZE 39000 SCFM 0 % LEL PROCESS TEMP. 300°F

CONTROL EQUIPTMENT DESCRIPTION

THERMAL INCINERATOR - CASE III FUME INCINERATOR WITH PRIMARY & SECONDARY HEAT EXCHANGERS & CATALYST BED

PROCESS OPERATING TIME - 2 SHIFTS/DAY - 365 DAYS/YR = 5,840 HRS

ITEM	DESCRIPTION	COST ($/YR)	
UTILITIES:			
WATER,			
STEAM,			
#2 FUEL OIL,	$1.50/10⁶ BTU: 7.2 x 10⁶/HR x 5840 HRS	63072	
ELECTRICITY,	$.03/KWH x 5840 HRS x .746 KW/HP x 269.0 HP.	35158	
CATALYST REPLACEMENT	.0.4141 x $ 87,000. (3 YRS LIFE)	36,027	
DIRECT LABOR:	.5 HRS/SHIFT x 730 SHIFTS/YR x 8.00/HR	2920	—
SUPPLIES:			
MAINTENANCE BUILDING OVERHEAD TAXES & INSURANCE INTEREST & DEPRECIATION	USE 25% OF CAPITAL COSTS .25 x $ 284105	71026	
SECONDARY RECOVERY	1.50/10⁶ BTU x - 9 x 10⁶/HR x 5840 HRS SAVINGS	-42924	
	TOTAL OPERATING COST	165279	

OPERATING COST ESTIMATE

UNIT SIZE 39000 SCFM 5 % LEL PROCESS TEMP. 300°F

CONTROL EQUIPTMENT DESCRIPTION

THERMAL INCINERATOR - CASE III FUME INCINERATOR WITH PRIMARY & SECONDARY HEAT EXCHANGERS & CATALYST BED

PROCESS OPERATING TIME - 2 SHIFTS/DAY - 365 DAYS/YR = 5,840 HRS

ITEM	DESCRIPTION	COST ($/YR)
UTILITIES:		
WATER,		
STEAM,		
#2 FUEL OIL,	$1.50/10⁶ BTU: 5.1 x 10⁶/HR x 5840 HRS	44676
ELECTRICITY,	$.03/KWH x 5840 HRS x .746 KW/HP x 269.0 HP.	35158
CATALYST REPLACEMT	.0.4141 x $87,000. (3 YRS LIFE)	36,027
DIRECT LABOR:	.5 HRS/SHIFT x 730 SHIFTS/YR x 8.00/HR	2920
SUPPLIES:		
MAINTENANCE BUILDING OVERHEAD TAXES & INSURANCE INTEREST & DEPRECIATION	USE 25% OF CAPITAL COSTS .25 x $ 284105	71026
SECONDARY RECOVERY	1.50/10⁶ BTU: 6.0 x 10⁶/HR x 5840 HRS SAVINGS	-52560
	TOTAL OPERATING COST	137247

OPERATING COST ESTIMATE

UNIT SIZE 39,000 SCFM 15 % LEL PROCESS TEMP. 300°F

CONTROL EQUIPTMENT DESCRIPTION

THERMAL INCINERATOR - CASE III FUME INCINERATOR WITH PRIMARY & SECONDARY HEAT EXCHANGERS & CATALYST BED

PROCESS OPERATING TIME - 2 SHIFTS/DAY - 365 DAYS/YR = 5,840 HRS

ITEM	DESCRIPTION	COST ($/YR)
UTILITIES:		
WATER,		
STEAM,		
#2 FUEL OIL,	$1.50/10⁶ BTU: 1.7 x 10⁶/HR x 5840 HRS	14892
ELECTRICITY,	$.03/KWH @ 5840 HRS x .746 KW/HP x 269.0 HP.	35158
CATALYST REPLACEMT	.0.4141 x $87,000. (3 YRS LIFE)	36,027
DIRECT LABOR:	.5 HRS/SHIFT x 730 SHIFTS/YR x 8.00/HR	2920
SUPPLIES:		
MAINTENANCE BUILDING OVERHEAD TAXES & INSURANCE INTEREST & DEPRECIATION	USE 25% OF CAPITAL COSTS .25 x $ 323045	80761
SECONDARY RECOVERY	1.50/10⁶ BTU @ 8.0 x 10⁶/HR x 5840 HRS SAVINGS	-70080
	TOTAL OPERATING COST	99678

OPERATING COST ESTIMATE

UNIT SIZE 30,000 SCFM 25 % LEL PROCESS TEMP. 300°F

CONTROL EQUIPTMENT DESCRIPTION

THERMAL INCINERATOR - CASE III FUME INCINERATOR WITH PRIMARY & SECONDARY HEAT EXCHANGERS & CATALYST BED

PROCESS OPERATING TIME - 2 SHIFTS/DAY - 365 DAYS/YR = 5,840 HRS

ITEM	DESCRIPTION	COST ($/YR)	
UTILITIES:			
WATER,			
STEAM,			
#2 FUEL OIL,	$1.50/10⁶ BTU X _____ X 10⁶/HR [illegible] HRS	—	
ELECTRICITY,	$.03/KWH X 5840 HRS X [illegible] _____ HP.	—	
CATALYST REPLACEMENT	.0.4141 X $87,00[illegible] LIFE)	36,027	
DIRECT LABOR:	.5 HRS/SHIFT X [illegible] /YR X 8.[illegible]/HR	2920	—
SUPPLIES:			
MAINTENANCE	OPERATION AT ABOVE DESIGN CONDITIONS NOT RECOMMENDED		
BUILDING OVERHEAD	25% OF CAPITAL COSTS		
TAXES & INSURANCE	25 X $ 323045	80761	
INTREST & DEPRECIATION	OPERATION AT ABOVE DESIGN CONDITIONS NOT RECOMMENDED		
SECONDARY RECOVERY	1.50/10⁶ BTU X X 10⁶/HR X 5840 HRS SAVINGS —	-	
	TOTAL OPERATING COST	-	

CASE 4, INCINERATION

WITH DIRECT REUSE OF EXHAUST OF GASES

CASE 4 GRAPHS

Fuel Requirement for Incinerator - This is the fuel required in terms of Btu's per hour for 5 through 15 thousand SCFM flows with LEL's of 0-25%. Almost identical to the Case 2 graph with process temperature of 300°.

Fuel Required for Oven and Incinerator Combined - Adds in the fuel required by the oven for normal operation with recirculation, e.g. for an oven exhausting 6,000 SCFM @ 300°F, approximately 8.8 MM Btu's per hour are required without recirculation. With recirculation approximately 3.8 MM Btu's per hour are inputed to the oven, consequently the oven fuel requirement is about 5 MM Btu per hour.

Annualized Operating Cost of Incinerator - Total fuel cost, electricity, direct labor and 25% of capital costs for a yearly operating expense. Graph is very similar to Operating Cost - Case 2 - 300°F - no catalyst.

Annualized Operating Cost of Incinerator Including Cost of Oven Fuel - Adds in oven fuel cost to above graph - e.g. at 6,000 SCFM exhaust at 300°F with recirculation of incinerator exhaust gases the fuel required by the oven is approximately 5.0 MM Btu per hour. At 1.50 dollars per MM Btu and 5,840 hours per year operation the cost is about 44,000 dollars per year. Added to the incinerator operating cost of 88,000 dollars per year the total is 132,000 dollars per year.

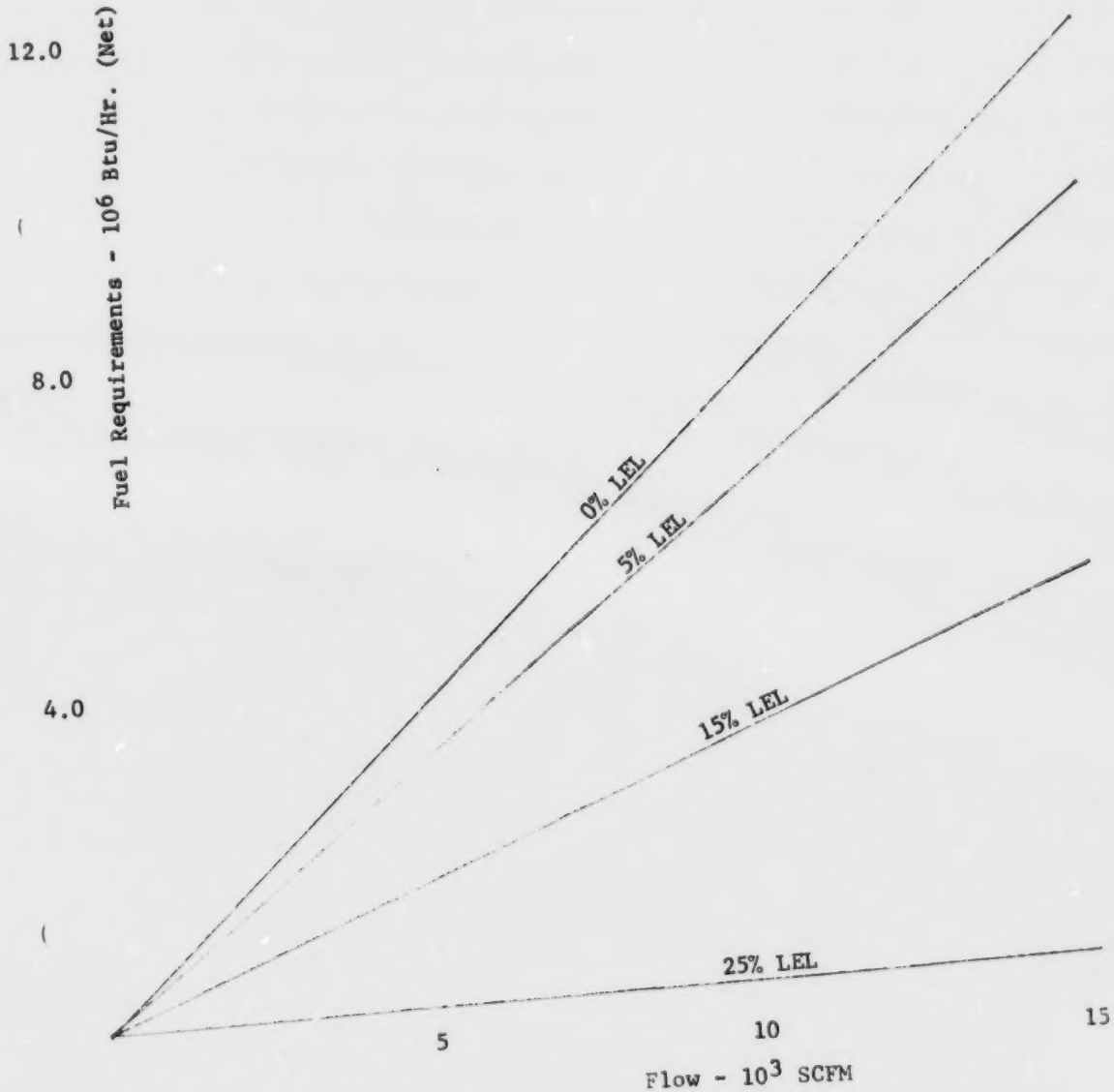
Preceding page blank

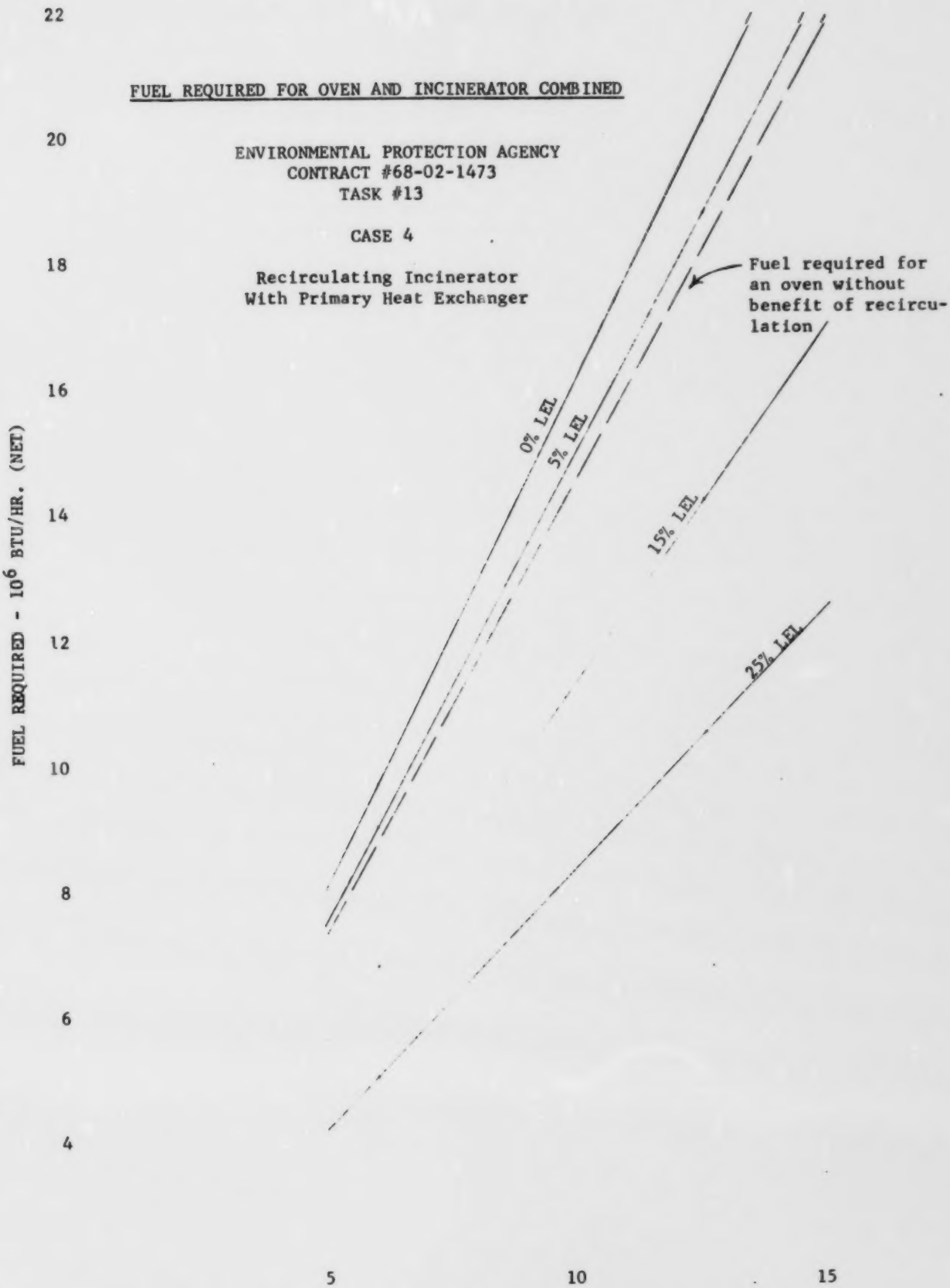
FUEL REQUIREMENT FOR INCINERATOR

ENVIRONMENTAL PROTECTION AGENCY
CONTRACT #68-02-1473
TASK #13

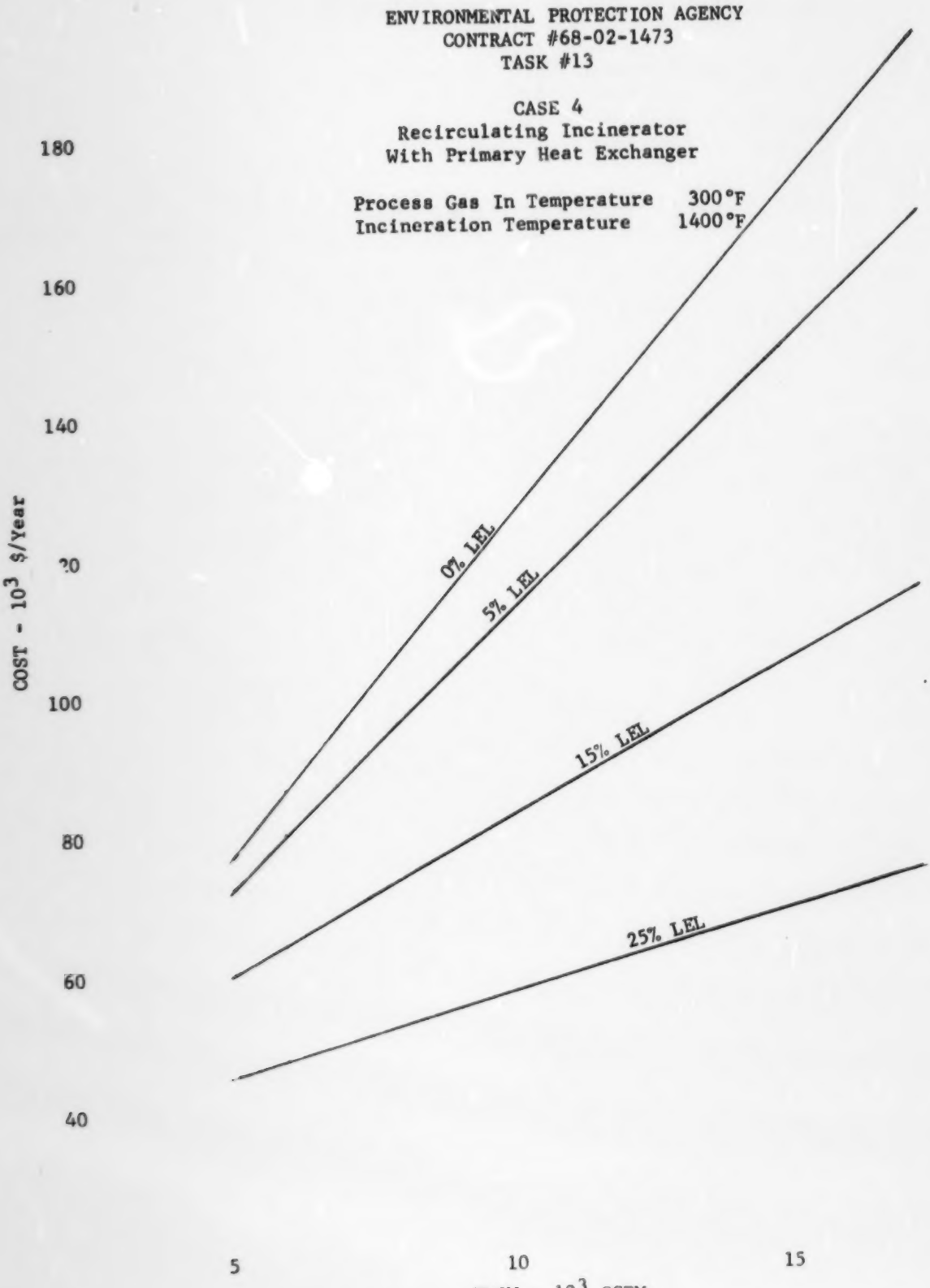
CASE 4
Recirculating Incinerator
With Primary Heat Exchanger

Process Gas In Temperature 300°F
Incineration Temperature 1400°F
Natural Gas Fuel
Density .0458 #/CF.
Heating Value 1002 Btu/CF (HHV)
Heating Value 904 Btu/CF (LHV)




FUEL REQUIRED FOR OVEN AND INCINERATOR COMBINED
ENVIRONMENTAL PROTECTION AGENCY
CONTRACT #68-02-1473
TASK #13
CASE 4
Recirculating Incinerator
With Primary Heat Exchanger
Fuel required for an oven without benefit of recirculation
0% LEL
5% LEL
15% LEL
25% LEL
FUEL REQUIRED - 10^6 BTU/HR. (NET)
22
20
18
16
14
12
10
8
6
4
5
10
15
FLOW - 10^3 SCFM

ANNUALIZED OPERATING COST OF INCINERATOR

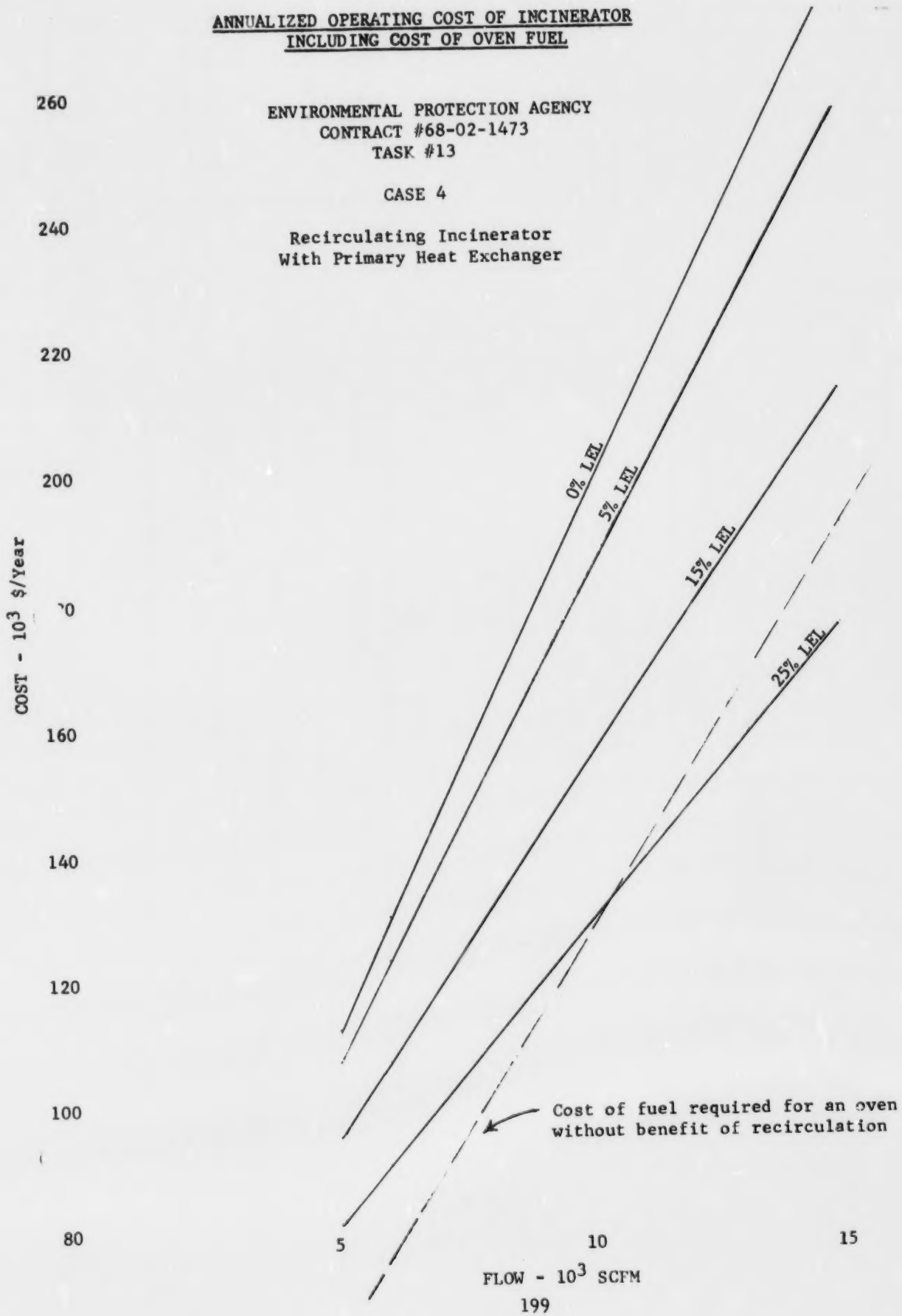


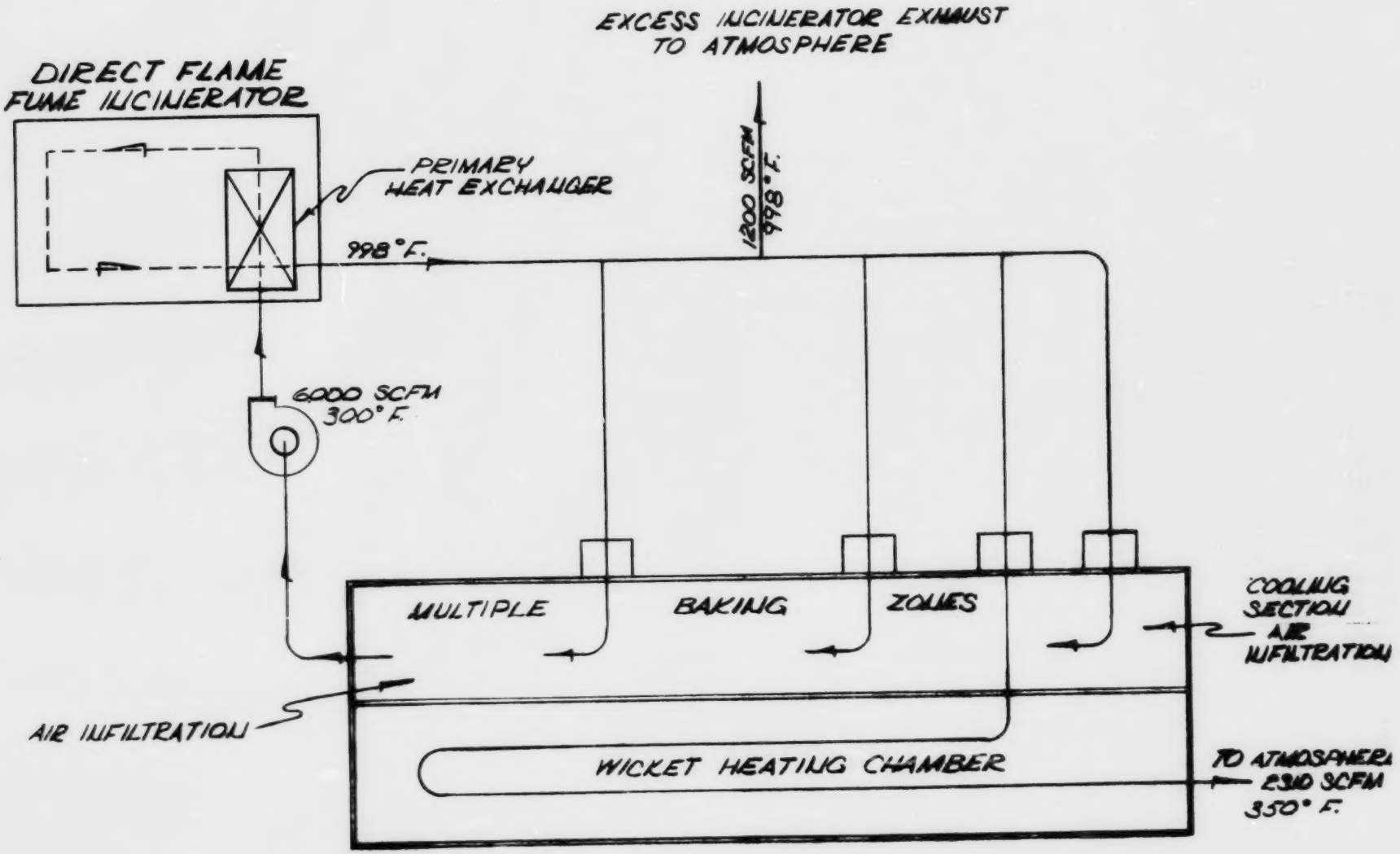
ANNUALIZED OPERATING COST OF INCINERATOR INCLUDING COST OF OVEN FUEL

ENVIRONMENTAL PROTECTION AGENCY
CONTRACT #68-02-1473
TASK #13

CASE 4

Recirculating Incinerator
With Primary Heat Exchanger

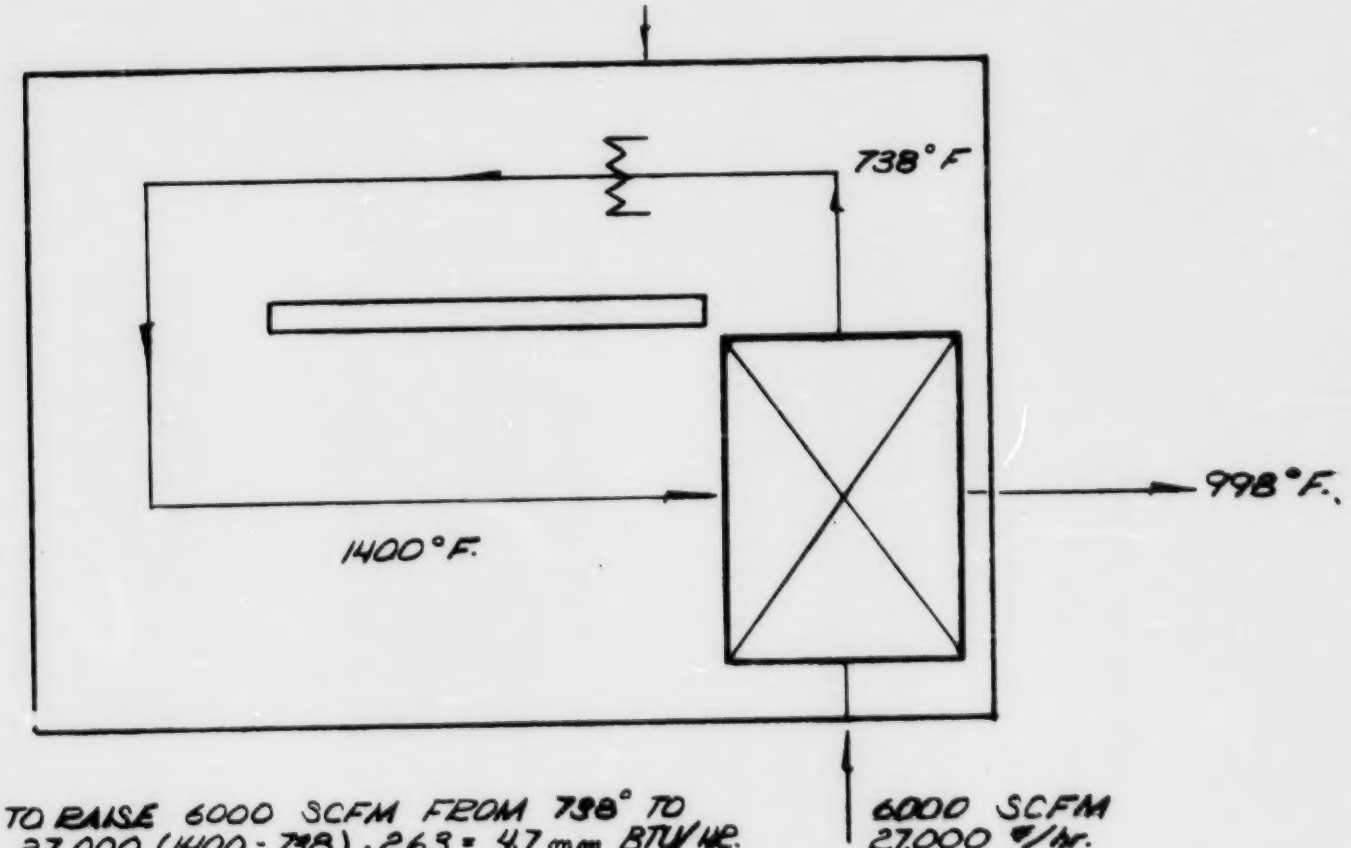




C.E. AIR PREHEATER		
WAGNER D.E.F. HEAT RECOVERY OVEN		
7118	2/24/76	J.F.J.

FUEL (NATURAL GAS)

@ 10 GPH SOLVENTS : 4.7 - 1.25 = 3.45 mm BTU/HR
@ 30 GPH SOLVENTS : 4.7 - 3.75 = 0.95 mm BTU/HR



HEAT REQUIRED TO RAISE 6000 SCFM FROM 798° TO 1400° F EQUALS 27,000 (1400 - 798) .263 = 4.7 mm BTU/HR.

SOLVENT HEAT RELEASE

10 GPH. x 125,000 BTU/GAL. = 1.25 mm BTU/HR.
30 GPH x 125,000 BTU/GAL. = 3.75 mm BTU/HR.

C.E. AIR PREHEATER		
DIRECT FLAME FUME INCINERATOR		
7618	3-11-76	F.J.

OPERATING COST ESTIMATE

DESCRIPTION: CASE 4 FUME INCINERATOR

PRIMARY HEAT RECOVERY - NO CATALYST

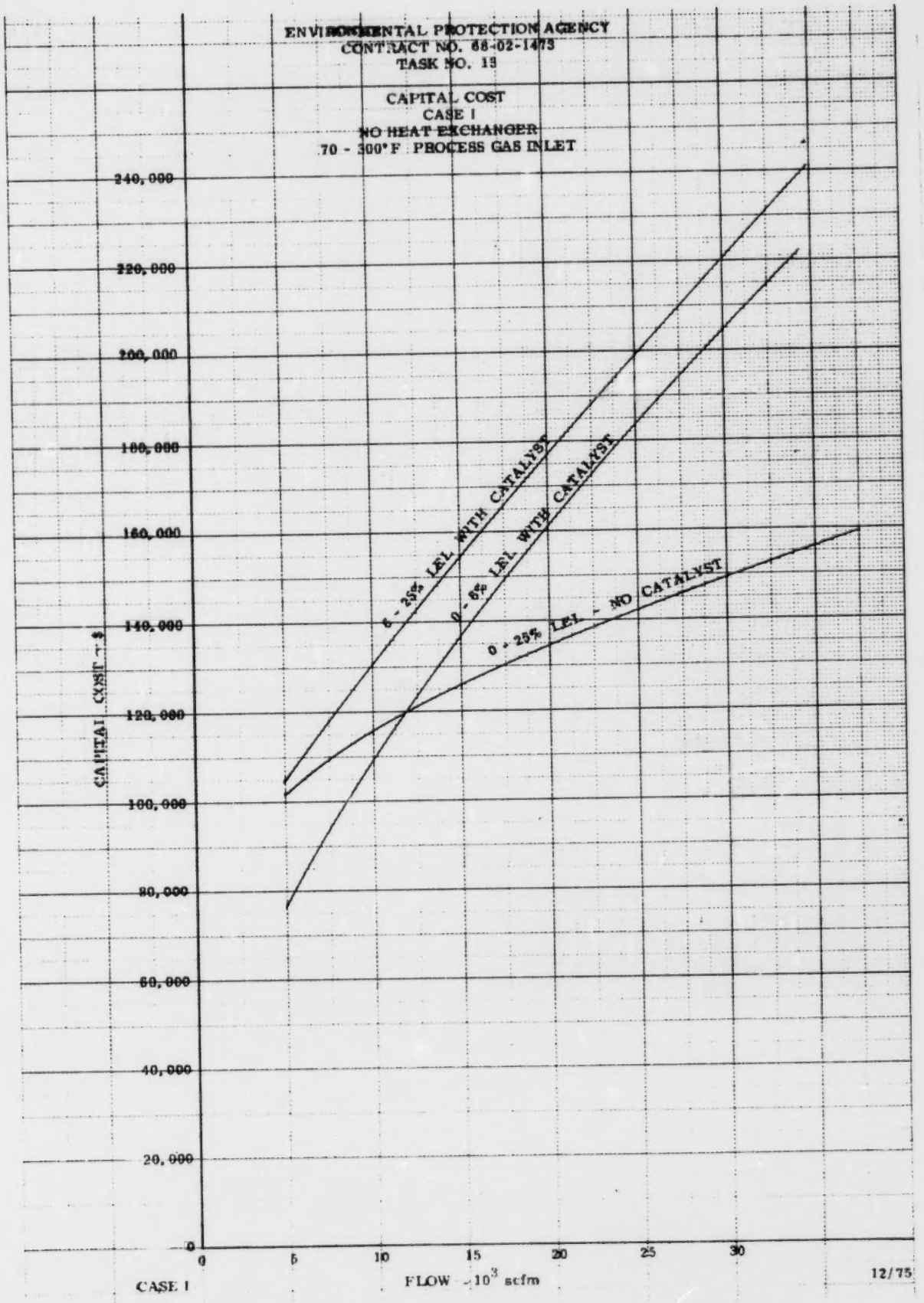
UNIT SIZE 6000 SCFM 7 to 21% LEL

PROCESS TEMPERATURE = 300°F

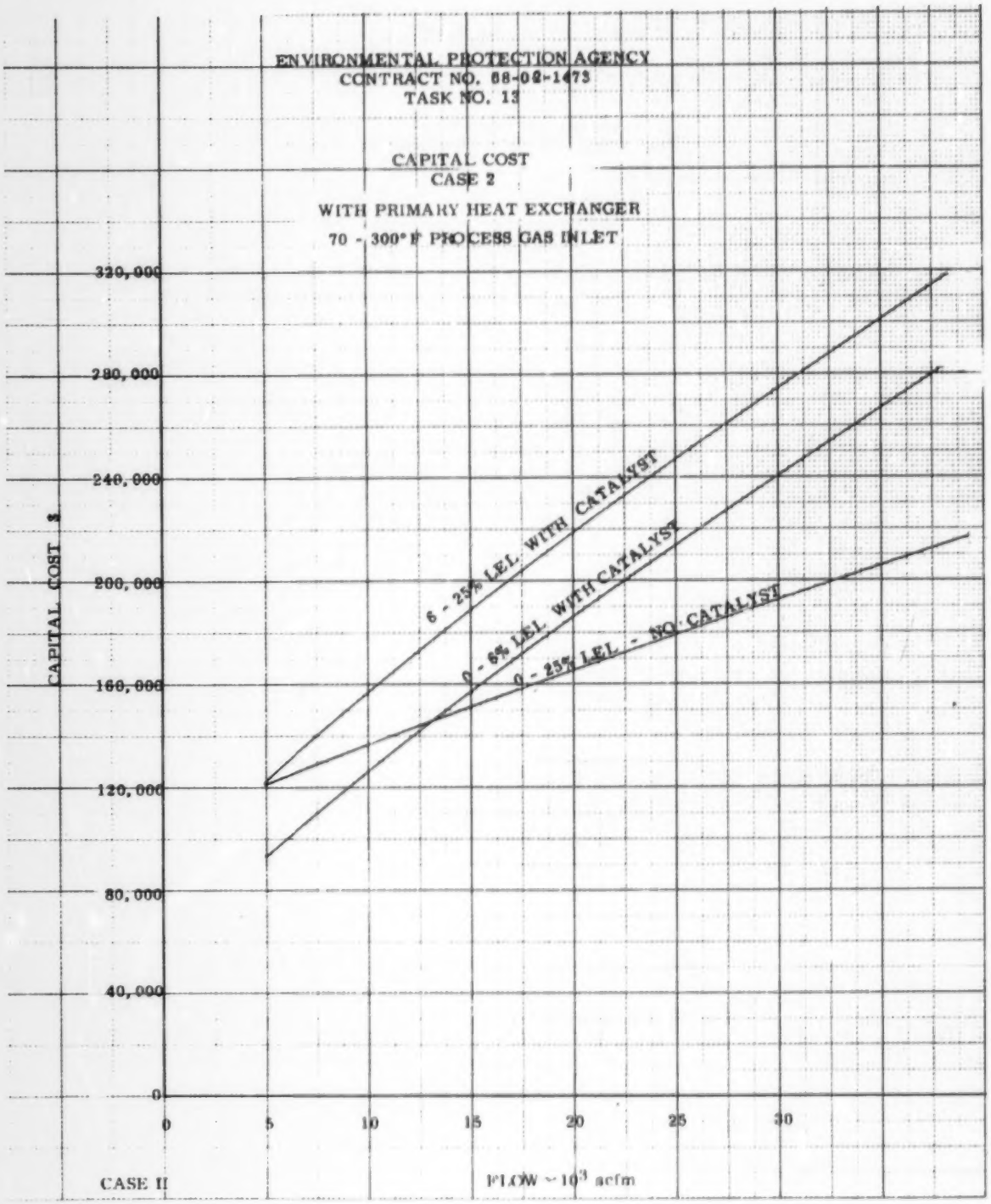
PROCESS OPERATING TIME - 2 Shifts/Day - 365 Days/Yr. = 5,840 Hrs.

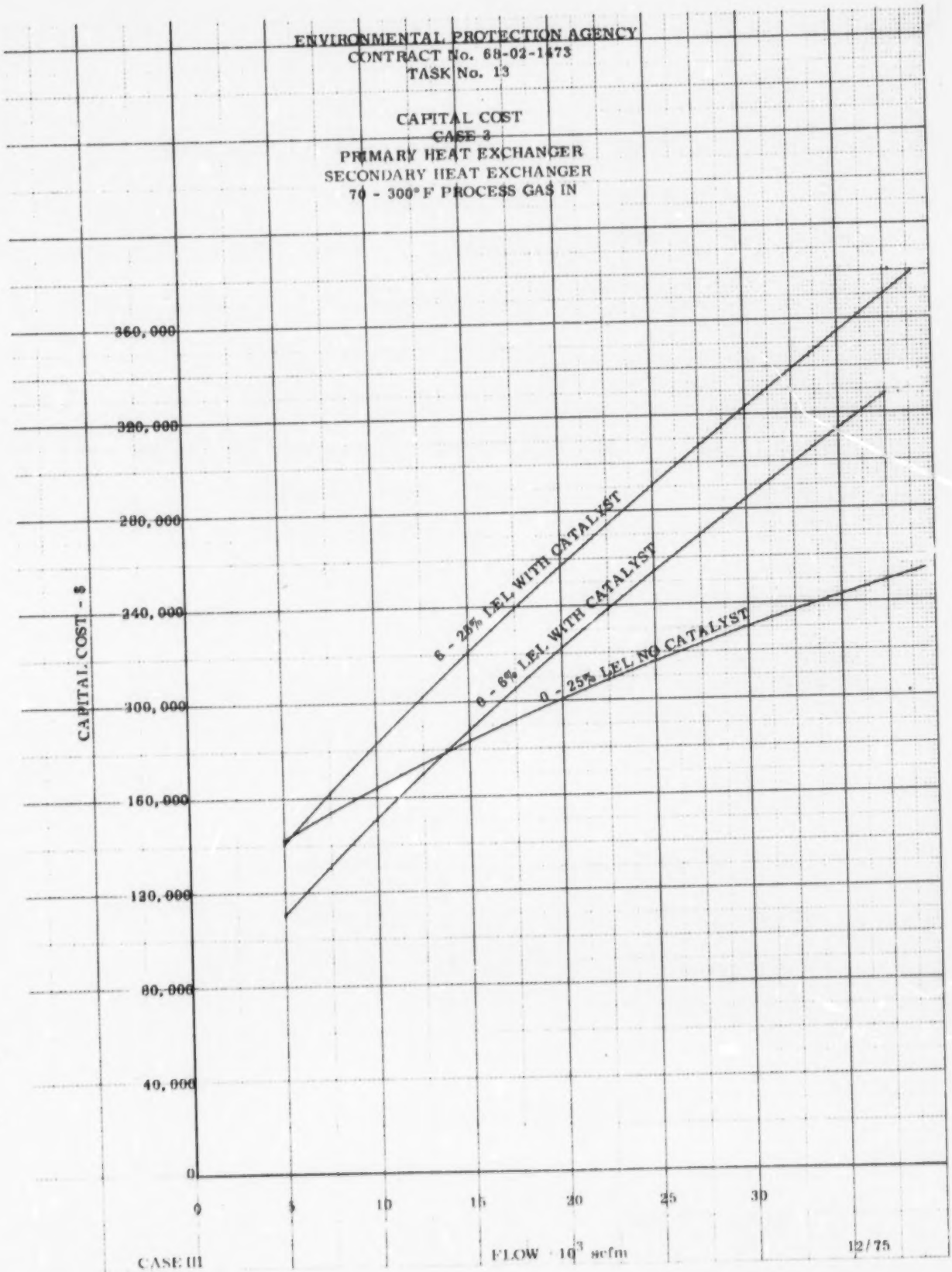
ITEM	DESCRIPTION	COST ($/YR.)
Utilities:		
Water, Steam, #2 Fuel Oil,	$\$1.50/10^6$ \$/Btu x $\frac{(3.45 + 0.95)}{2}$ x 10^6 Btu x 5840 Hrs.	19,300
Electricity	\$ .03/KWH x 5840 Hrs. x .746 KW/HP x 37 HP	4,840
Direct Labor:	.5 Hrs./Shift x 730 Shifts/Yrs. x \$8.00/Hr.	2,920
Supplies:		
Maintenance, Building Overhead, Taxes & Insurance, Interest & Depreciation	Use 25% of Capital Costs .25 x \$151,900	38,000
	TOTAL OPERATING COST	\$65,060

APPENDIX: CAPITAL COSTS FOR AFTERBURNERS



Preceding page blank


ENVIRONMENTAL PROTECTION AGENCY
CONTRACT NO. 68-02-1473
TASK NO. 13
CAPITAL COST
CASE 2
WITH PRIMARY HEAT EXCHANGER
70 - 300° F PROCESS GAS INLET
CAPITAL COST $
320,000
280,000
240,000
200,000
160,000
120,000
80,000
40,000
0
0
5
10
15
20
25
30
6 - 25% LEL WITH CATALYST
0 - 6% LEL WITH CATALYST
0 - 25% LEL - NO CATALYST
CASE II
FLOW ~ 10³ acfm


ENVIRONMENTAL PROTECTION AGENCY
CONTRACT No. 68-02-1473
TASK No. 13
CAPITAL COST
CASE 3
PRIMARY HEAT EXCHANGER
SECONDARY HEAT EXCHANGER
70 - 300° F PROCESS GAS IN
CAPITAL COST - $
360,000
320,000
280,000
240,000
200,000
160,000
120,000
80,000
40,000
0
0
5
10
15
20
25
30
FLOW - 10³ scfm
6 - 25% LEL WITH CATALYST
6 - 6% LEL WITH CATALYST
0 - 25% LEL NO CATALYST
CASE III
12/75

Construction Cost Estimate

DESCRIPTION — CASE I FUME INCINERATOR

NO HEAT RECOVERY - NO CATALYST

UNIT SIZE 5000 SCFM 0 TO 25% LEL

PROCESS TEMP: 70°F TO 300°F

QUANTITY	ITEM & DESCRIPTION		ESTIMATED COST
1	5000 SCFM FUME INCINERATOR SKID MOUNTED NOZZEL MIX BURNER FOR #2 FUEL OIL INCLUDING UNIT MOUNTED CONTROLS, PIPING & STUB (10') STACK. UNIT TO BE COMPLETELY SHOP INSULATED		59,000 —
	AUXILIARY EQUIPTMENT		5900 —
	EXCAVATION & FOUNDATIONS PIPING & DUCT WORK INSULATION ELECTRICAL PAINTING	INSTALLATION COSTS	35,000 —
	INTEREST ON INVESTMENT DURING CONSTRUCTION (THREE MONTHS @ 7½% PRIME RATE)		1,875 —
	TOTAL CAPITAL COST		101,775 —

Construction Cost Estimate

DESCRIPTION -- CASE I FUME INCINERATOR

No HEAT RECOVERY - No CATALYST

UNIT SIZE 15000 SCFM 0 TO 25% LEL

PROCESS TEMP: 70°F TO 300°F

QUANTITY	ITEM & DESCRIPTION		ESTIMATED COST
1	15000 SCFM FUME INCINERATOR SKID MOUNTED NOZZEL MIX BURNER FOR #2 FUEL OIL INCLUDING UNIT MOUNTED CONTROLS, PIPING & STUB (10') STACK. UNIT TO BE COMPLETLY SHOP INSULATED		76,000 —
	AUXILIARY EQUIPTMENT		7600 —
	EXCAVATION & FOUNDATIONS PIPING & DUCT WORK INSULATION ELECTRICAL PAINTING	INSTALLATION COSTS	40,000 —
	INTEREST ON INVESTMENT DURING CONSTRUCTION (THREE MONTHS @ 7½ % PRIME RATE)		2,320 —
	TOTAL CAPITAL COST		125,920 —

Construction Cost Estimate

DESCRIPTION — CASE I FUME INCINERATOR

NO HEAT RECOVERY - NO CATALYST

UNIT SIZE 30,000 SCFM 0 TO 25% LEL

PROCESS TEMP: 70°F TO 300°F

QUANTITY	ITEM & DESCRIPTION		ESTIMATED COST
1	30,000 SCFM FUME INCINERATOR SKID MOUNTED NOZZEL MIX BURNER FOR #2 FUEL OIL INCLUDING UNIT MOUNTED CONTROLS, PIPING & STUB (10') STACK. UNIT TO BE COMPLETLY SHOP INSULATED		88,000 —
	AUXILIARY EQUIPTMENT		8,800 —
	EXCAVATION & FOUNDATIONS PIPING & DUCT WORK INSULATION ELECTRICAL PAINTING	INSTALLATION COSTS	50,000 —
	INTEREST ON INVESTMENT DURING CONSTRUCTION (THREE MONTHS @ 7½% PRIME RATE)		2750 —
	TOTAL CAPITAL COST		149,550 —

CONSTRUCTION COST ESTIMATE

DESCRIPTION — CASE I FUME INCINERATOR WITH CATALYST - NO HEAT RECOVERY

UNIT SIZE 5,000 SCFM (0 TO 6 % LEL)

PROCESS TEMP : 70°F TO 300°F

QUANTITY	ITEM & DESCRIPTION		ESTIMATED COST
1	5,000 SCFM FUME INCINERATOR		
	SKID MOUNTED NOZZEL MIX BURNER FOR # 2 OIL, WITH CATALYST BED		140430 —
	INCLUDING UNIT MOUNTED CONTROLS PIPING & STUB (10') STACK		
	UNIT TO BE COMPLETELY SHOP INSULATED		
	AUXILARY EQUIPTMENT		
	EXCAVATION & FOUNDATIONS	INSTALLATION COSTS	35,000 —
	PIPING & DUCT WORK		
	INSULATION		
	ELECTRICAL		
	PAINTING		
	INTEREST ON INVESTMENT DURING CONSTRUCTION (THREE MONTHS @ 7½ % PRIME RATE)		1415 —
	TOTAL CAPITAL COST		176845 —

CONSTRUCTION COST ESTIMATE

DESCRIPTION — CASE I FUME INCINERATOR WITH CATALYST - NO HEAT RECOVERY

UNIT SIZE 5,000 SCFM (6702.5 % LEL)

PROCESS TEMP : 70°F TO 300°F

QUANTITY	ITEM & DESCRIPTION	ESTIMATED COST
1	5000 SCFM FUME INCINERATOR SKID MOUNTED NOZZEL MIX BURNER FOR #2 OIL, WITH CATALYST BED INCLUDING UNIT MOUNTED CONTROLS PIPING & STUB (10') STACK UNIT TO BE COMPLETELY SHOP INSULATED	67,600 —
	AUXILARY EQUIPTMENT	
	EXCAVATION & FOUNDATIONS PIPING & DUCT WORK INSULATION ELECTRICAL PAINTING } INSTALLATION COSTS	35,000
	INTEREST ON INVESTMENT DURING CONSTRUCTION (THREE MONTHS @ 7½ % PRIME RATE)	1925 —
	TOTAL CAPITAL COST	104,525 —

CONSTRUCTION COST ESTIMATE

DESCRIPTION — CASE I FUME INCINERATOR WITH CATALYST - NO HEAT RECOVERY

UNIT SIZE 15,000 SCFM (0 TO 6% LEL)

PROCESS TEMP : 70°F TO 300°F

QUANTITY	ITEM & DESCRIPTION		ESTIMATED COST
1	15,000 SCFM FUME INCINERATOR SKID MOUNTED NOZZEL MIX BURNER FOR #2 OIL, WITH CATALYST BED INCLUDING UNIT MOUNTED CONTROLS PIPING & STUB (10') STACK UNIT TO BE COMPLETELY SHOP INSULATED		88,275 —
	AUXILARY EQUIPTMENT		
	EXCAVATION & FOUNDATIONS PIPING & DUCT WORK INSULATION ELECTRICAL PAINTING	INSTALLATION COSTS	40,000 —
	INTEREST ON INVESTMENT DURING CONSTRUCTION (THREE MONTHS @ 7½% PRIME RATE)		2405 —
	TOTAL CAPITAL COST		136,080 —

CONSTRUCTION COST ESTIMATE

DESCRIPTION — CASE I FUME INCINERATOR WITH CATALYST - NO HEAT RECOVERY

UNIT SIZE 15,000 SCFM (6 TO 25% LEL)

PROCESS TEMP : 70°F TO 300°F

QUANTITY	ITEM & DESCRIPTION	ESTIMATED COST
1	15,000 SCFM FUME INCINERATOR SKID MOUNTED NOZZEL MIX BURNER FOR #2 OIL, WITH CATALYST BED INCLUDING UNIT MOUNTED CONTROLS PIPING & STUB (10') STACK UNIT TO BE COMPLETELY SHOP INSULATED	111,900 —
	AUXILARY EQUIPTMENT	
	EXCAVATION & FOUNDATIONS PIPING & DUCT WORK INSULATION ELECTRICAL PAINTING } INSTALLATION COSTS	40,000 —
	INTEREST ON INVESTMENT DURING CONSTRUCTION (THREE MONTHS @ 7½% PRIME RATE)	2850
	TOTAL CAPITAL COST	154,750 —

CONSTRUCTION COST ESTIMATE

DESCRIPTION — CASE I FUME INCINERATOR WITH CATALYST - NO HEAT RECOVERY

UNIT SIZE 30,000 SCFM (0 TO 6% LEL)

PROCESS TEMP : 70°F TO 300°F

QUANTITY	ITEM & DESCRIPTION		ESTIMATED COST
1	30,000 SCFM FUME INCINERATOR SKID MOUNTED NOZZEL MIX BURNER FOR #2 OIL, WITH CATALYST BED INCLUDING UNIT MOUNTED CONTROLS PIPING & STUB (10') STACK UNIT TO BE COMPLETLY SHOP INSULATED		150,650 —
	AUXILARY EQUIPTMENT		
	EXCAVATION & FOUNDATIONS PIPING & DUCT WORK INSULATION ELECTRICAL PAINTING	INSTALLATION COSTS	50,000 —
	INTEREST ON INVESTMENT DURING CONSTRUCTION (THREE MONTHS @ 7½% PRIME RATE)		3760 —
	TOTAL CAPITAL COST		204410

CONSTRUCTION COST ESTIMATE

DESCRIPTION — CASE I FUME INCINERATOR WITH CATALYST - NO HEAT RECOVERY

UNIT SIZE 30,000 SCFM (6 TO 25% LEL)

PROCESS TEMP : 70°F TO 300°F

QUANTITY	ITEM & DESCRIPTION		ESTIMATED COST
1	30,000 SCFM FUME INCINERATOR SKID MOUNTED NOZZEL MIX BURNER FOR #2 OIL, WITH CATALYST BED INCLUDING UNIT MOUNTED CONTROLS PIPING & STUB (10') STACK UNIT TO BE COMPLETLY SHOP INSULATED		164,200 —
	AUXILARY EQUIPTMENT		
	EXCAVATION & FOUNDATIONS PIPING & DUCT WORK INSULATION ELECTRICAL PAINTING	INSTALLATION COSTS	50,000 —
	INTEREST ON INVESTMENT DURING CONSTRUCTION (THREE MONTHS @ 7½% PRIME RATE)		4,055
		TOTAL CAPITAL COST	220,255

Reproduced from best available copy.

CONSTRUCTION COST ESTIMATE

DESCRIPTION — CASE II FUME INCINERATOR WITH HEAT EXCHANGE - NO CATALYST

UNIT SIZE 5,000 SCFM (0-25% LEL) 70°F

PROCESS TEMP = 70° TO 300°F (0-20% LEL) 300°F

QUANTITY	ITEM & DESCRIPTION		ESTIMATED COST
1	5,000 SCFM FUME INCINERATOR NOZZEL MIX BURNER FOR #2 OIL WITH CASE II HEAT EXCHANGER INCLUDING UNIT MOUNTED CONTROLS, PIPING & STUB(10)STACK UNIT TO BE COMPLETLY SHOP INSULATED		75,000 —
	AUXILARY EQUIPTMENT		6400 —
	EXCAVATION & FOUNDATIONS PIPING & DUCT WORK INSULATION ELECTRICAL PAINTING	INSTALLATION COSTS	37,500 —
	INTEREST ON INVESTMENT DURING CONSTRUCTION (THREE MONTHS @ 7½% PRIME RATE)		2,230 —
	TOTAL CAPITAL COST		121,130 —

CONSTRUCTION COST ESTIMATE

DESCRIPTION -- CASE II FUME INCINERATOR WITH HEAT EXCHANGE - NO CATALYST

UNIT SIZE: 5,000 SCFM 20-25% LEL

PROCESS TEMP = 300°F

QUANTITY	ITEM & DESCRIPTION		ESTIMATED COST
1	5,000 SCFM FUME INCINERATOR		81,000 —
	NOZZEL MIX BURNER FOR #2 OIL WITH CASE II HEAT EXCHANGER INCLUDING UNIT MOUNTED CONTROLS, PIPING & STUB(10) STACK UNIT TO BE COMPLETLY SHOP INSULATED		
	AUXILARY EQUIPTMENT		6400 —
	EXCAVATION & FOUNDATIONS	INSTALLATION COSTS	
	PIPING & DUCT WORK		37,500 —
	INSULATION		
	ELECTRICAL		
	PAINTING		
	INTEREST ON INVESTMENT DURING CONSTRUCTION (THREE MONTHS @ 7½ % PRIME RATE)		2,230 —
	TOTAL CAPITOL COST		127,130 —

Construction Cost Estimate

DESCRIPTION -- CASE II FUME INCINERATOR
WITH HEAT EXCHANGE - NO CATALYST
UNIT SIZE 15,000 SCFM (0.25% LEL) 70°F
PROCESS TEMP = 70° TO 300°F (0.20% LEL) 300°F

QUANTITY	ITEM & DESCRIPTION		ESTIMATED COST
1	15000 SCFM FUME INCINERATOR NOZZEL MIX BURNER FOR #2 OIL WITH CASE II HEAT EXCHANGER INCLUDING UNIT MOUNTED CONTROLS, PIPING & STUB(10)STACK UNIT TO BE COMPLETLY SHOP INSULATED		96000 —
	AUXILARY EQUIPTMENT		8650 —
	EXCAVATION & FOUNDATIONS PIPING & DUCT WORK INSULATION ELECTRICAL PAINTING	INSTALLATION COSTS	44,000 —
	INTEREST ON INVESTMENT DURING CONSTRUCTION (THREE MONTHS @ 7½% PRIME RATE)		2790 —
	TOTAL CAPITAL COST		151440

Construction Cost Estimate

DESCRIPTION -- CASE II FUME INCINERATOR WITH HEAT EXCHANGE - NO CATALYST

UNIT SIZE 15,000 SCFM 20-25% L.E.L.

PROCESS TEMP = 300°F

QUANTITY	ITEM & DESCRIPTION		ESTIMATED COST
1	15,000 SCFM FUME INCINERATOR NOZZEL MIX BURNER FOR #2 OIL WITH CASE II HEAT EXCHANGER INCLUDING UNIT MOUNTED CONTROLS, PIPING & STUB(10) STACK UNIT TO BE COMPLETELY SHOP INSULATED		103,500 —
	AUXILARY EQUIPTMENT		8650 —
	EXCAVATION & FOUNDATIONS PIPING & DUCT WORK INSULATION ELECTRICAL PAINTING	INSTALLATION COSTS	44,000 —
	INTEREST ON INVESTMENT DURING CONSTRUCTION (THREE MONTHS @ 7½ % PRIME RATE)		2790 —
	TOTAL CAPITAL COST		158,940 —

Construction Cost Estimate

DESCRIPTION -- CASE II FUME INCINERATOR
WITH HEAT EXCHANGE - NO CATALYST
UNIT SIZE 30,000 SCFM (0.25% LEL) 70°F
PROCESS TEMP = 70° TO 300°F (0.20% LEL) 300°F

QUANTITY	ITEM & DESCRIPTION		ESTIMATED COST
1	30,000 SCFM FUME INCINERATOR		124,000 —
	NOZZEL MIX BURNER FOR #2 OIL WITH CASE II HEAT EXCHANGER INCLUDING UNIT MOUNTED CONTROLS, PIPING & STUB(10)STACK UNIT TO BE COMPLETLY SHOP INSULATED		
	AUXILARY EQUIPTMENT		10,500 —
	EXCAVATION & FOUNDATIONS	INSTALLATION COSTS	55,000 —
	PIPING & DUCT WORK		
	INSULATION		
	ELECTRICAL		
	PAINTING		
	INTEREST ON INVESTMENT DURING CONSTRUCTION (THREE MONTHS @ 7½% PRIME RATE)		3,550 —
	TOTAL CAPITAL COST		193,050

CONSTRUCTION COST ESTIMATE

DESCRIPTION -- CASE II FUME INCINERATOR WITH HEAT EXCHANGE - NO CATALYST

UNIT SIZE 30,000 SCFM @ 20-25 % LEL

PROCESS TEMP = 300°F

QUANTITY	ITEM & DESCRIPTION		ESTIMATED COST
1	30,000 SCFM FUME INCINERATOR NOZZEL MIX BURNER FOR #2 OIL WITH CASE II HEAT EXCHANGER INCLUDING UNIT MOUNTED CONTROLS, PIPING & STUB(10)STACK UNIT TO BE COMPLETLY SHOP INSULATED		132,500 —
	AUXILARY EQUIPTMENT		10,500 —
	EXCAVATION & FOUNDATIONS PIPING & DUCT WORK INSULATION ELECTRICAL PAINTING	INSTALLATION COSTS	55,000 —
	INTEREST ON INVESTMENT DURING CONSTRUCTION (THREE MONTHS @ 7½ % PRIME RATE)		3,550 —
	TOTAL CAPITAL COST		201,550 —

CONSTRUCTION COST ESTIMATE

DESCRIPTION — CASE II FUME INCINERATOR WITH CATALYST & HEAT RECOVERY

UNIT SIZE 5,000 SCFM (0 TO 6% LEL)

PROCESS TEMP = 70°F TO 300°F

QUANTITY	ITEM & DESCRIPTION		ESTIMATED COST
1	5,000 SCFM FUME INCINERATOR NOZZEL MIX BURNER FOR #2 OIL WITH CASE II HEAT EXCHANGER AND CATALYST BED INCLUDING UNIT MOUNTED CONTROLS, PIPING & STUB (10') STACK UNIT TO BE COMPLETLY SHOP INSULATED		53,700
	AUXILARY EQUIPTMENT		
	EXCAVATION & FOUNDATIONS PIPING & DUCT WORK INSUCATION ELECTRICAL PAINTING	INSTALLATION COSTS	37500 —
	INTEREST ON INVESTMENT DURING CONSTRUCTION (THREE MONTHS @ 7½% PRIME RATE)		1,710 —
	TOTAL CAPITAL COST		92,910 —

CONSTRUCTION COST ESTIMATE

DESCRIPTION — CASE II FUME INCINERATOR WITH CATALYST & HEAT RECOVERY

UNIT SIZE 5000 SCFM (6 TO 25% LEL)

PROCESS TEMP = 70°F TO 300°F

QUANTITY	ITEM & DESCRIPTION		ESTIMATED COST
1	5000 SCFM FUME INCINERATOR NOZZEL MIX BURNER FOR #2 OIL WITH CASE II HEAT EXCHANGER AND CATALYST BED INCLUDING UNIT MOUNTED CONTROLS, PIPING & STUB (10') STACK UNIT TO BE COMPLETLY SHOP INSULATED		82,000 —
	AUXILARY EQUIPTMENT		
	EXCAVATION & FOUNDATIONS PIPING & DUCT WORK INSULATION ELECTRICAL PAINTING	INSTALLATION COSTS	37,500 —
	INTEREST ON INVESTMENT DURING CONSTRUCTION (THREE MONTHS @ 7½% PRIME RATE)		2240 —
	TOTAL CAPITAL COST		121,740 —

Reproduced from best available copy.

CONSTRUCTION COST ESTIMATE

DESCRIPTION — CASE II FUME INCINERATOR WITH CATALYST & HEAT RECOVERY

UNIT SIZE 15,000 SCFM (0 TO 6% LEL)

PROCESS TEMP = 70°F TO 300°F

QUANTITY	ITEM & DESCRIPTION		ESTIMATED COST
1	15,000 SCFM FUME INCINERATOR NOZZEL MIX BURNER FOR #2 OIL WITH CASE II HEAT EXCHANGER AND CATALYST BED INCLUDING UNIT MOUNTED CONTROLS, PIPING & STUB (10') STACK UNIT TO BE COMPLETLY SHOP INSULATED		110,385
	AUXILARY EQUIPTMENT		
	EXCAVATION & FOUNDATIONS PIPING & DUCT WORK INSULATION ELECTRICAL PAINTING	INSTALLATION COSTS	44000
	INTEREST ON INVESTMENT DURING CONSTRUCTION (THREE MONTHS @ 7½% PRIME RATE)		2895 —
	TOTAL CAPITAL COST		157,280 —

CONSTRUCTION COST ESTIMATE

DESCRIPTION — CASE II FUME INCINERATOR WITH CATALYST & HEAT RECOVERY

UNIT SIZE 15,000 SCFM (6 TO 25% LEL)

PROCESS TEMP = 70°F TO 300°F

QUANTITY	ITEM & DESCRIPTION		ESTIMATED COST
1	15,000 SCFM FUME INCINERATOR NOZZEL MIX BURNER FOR #2 OIL WITH CASE II HEAT EXCHANGER AND CATALYST BED INCLUDING UNIT MOUNTED CONTROLS, PIPING & STUB (10') STACK UNIT TO BE COMPLETELY SHOP INSULATED		141,885 —
	AUXILARY EQUIPTMENT		
	EXCAVATION & FOUNDATIONS PIPING & DUCT WORK INSULATION ELECTRICAL PAINTING	INSTALLATION COSTS	44000 —
	INTEREST ON INVESTMENT DURING CONSTRUCTION (THREE MONTHS @ 7½% PRIME RATE)		3485 —
	TOTAL CAPITAL COST		189,370 —

Reproduced from best available copy.

CONSTRUCTION COST ESTIMATE

DESCRIPTION — CASE II FUME INCINERATOR WITH CATALYST & HEAT RECOVERY

UNIT SIZE 30,000 SCFM (0 TO 6% LEL)

PROCESS TEMP = 70°F TO 300°F

QUANTITY	ITEM & DESCRIPTION		ESTIMATED COST
1	30,000 SCFM FUME INCINERATOR NOZZEL MIX BURNER FOR #2 OIL WITH CASE II HEAT EXCHANGER AND CATALYST BED INCLUDING UNIT MOUNTED CONTROLS, PIPING & STUB (10') STACK UNIT TO BE COMPLETELY SHOP INSULATED		18200 —
	AUXILARY EQUIPTMENT		
	EXCAVATION & FOUNDATIONS PIPING & DUCT WORK INSULATION ELECTRICAL PAINTING	INSTALLATION COSTS	55000 —
	INTEREST ON INVESTMENT DURING CONSTRUCTION (THREE MONTHS @ 7½% PRIME RATE)		4445 —
	TOTAL CAPITAL COST		241,505 —

CONSTRUCTION COST ESTIMATE

DESCRIPTION — CASE II FUME INCINERATOR WITH CATALYST & HEAT RECOVERY

UNIT SIZE 30,000 SCFM (6 TO 25% LEL)

PROCESS TEMP = 70°F TO 300°F

QUANTITY	ITEM & DESCRIPTION		ESTIMATED COST
1	30,000 SCFM FUME INCINERATOR NOZZEL MIX BURNER FOR #2 OIL WITH CASE II HEAT EXCHANGER AND CATALYST BED INCLUDING UNIT MOUNTED CONTROLS, PIPING & STUB (10') STACK UNIT TO BE COMPLETLY SHOP INSULATED		215,060 —
	AUXILARY EQUIPTMENT		
	EXCAVATION & FOUNDATIONS PIPING & DUCT WORK INSULATION ELECTRICAL PAINTING	INSTALLATION COSTS	55,000 —
	INTEREST ON INVESTMENT DURING CONSTRUCTION (THREE MONTHS @ 7½% PRIME RATE)		5065 —
	TOTAL CAPITAL COST		275,125 —

CONSTRUCTION COST ESTIMATE

DESCRIPTION — CASE III FUME INCINERATOR
WITH HEAT RECOVERY & SECONDARY RECOVERY
UNIT SIZE 5,000 SCFM (0 TO 25% LEL) 70°F
PROCESS TEMP = 70°F TO 300°F (0 TO 20% LEL) 300°F

QUANTITY	ITEM & DESCRIPTION		ESTIMATED COST
1	5000 SCFM FUME INCINERATOR NOZZEL MIX BURNER FOR #2 OIL WITH CASE III HEAT EXCHANGER FOR SECONDARY HEAT RECOVERY TO PROCESS OVEN. INCLUDING UNIT MOUNTED CONTROLS, PIPING & STUB (10') STACK UNIT TO BE COMPLETLY SHOP INSULATED		91,000 —
	AUXILARY EQUIPTMENT		8850 —
	EXCAVATION & FOUNDATIONS PIPING & DUCT WORK INSULATION ELECTRICAL PAINTING	INSTALLITION COSTS	40,000 —
	INTEREST ON INVESTMENT DURING CONSTRUCTION (THREE MONTHS @ 7½% PRIME RATE)		2620 —
	TOTAL CAPITAL COST		142,470 —

CONSTRUCTION COST ESTIMATE

DESCRIPTION — CASE III FUME INCINERATOR WITH HEAT RECOVERY & SECONDARY RECOVERY

UNIT SIZE 5,000 SCFM (20 TO 25% LEL)

PROCESS TEMP = 300°F

QUANTITY	ITEM & DESCRIPTION		ESTIMATED COST	
1	5000 SCFM FUME INCINERATOR NOZZEL MIX BURNER FOR #2 OIL WITH CASE III HEAT EXCHANGER FOR SECONDARY HEAT RECOVERY TO PROCESS OVEN. INCLUDING UNIT MOUNTED CONTROLS, PIPING & STUB (10') STACK UNIT TO BE COMPLETELY SHOP INSULATED		97,000	—
	AUXILARY EQUIPTMENT		8850	—
	EXCAVATION & FOUNDATIONS PIPING & DUCT WORK INSULATION ELECTRICAL PAINTING	INSTALLATION COSTS	40,000	—
	INTEREST ON INVESTMENT DURING CONSTRUCTION (THREE MONTHS @ 7½% PRIME RATE)		2620	—
	TOTAL CAPITAL COST		148,440	—

Construction Cost Estimate

Description -- Case III Fume Incinerator
With Heat Recovery & Secondary Recovery
Unit Size 15,000 SCFM (0 To 25% LEL) 70°F
Process Temp = 70°F To 300°F (0 To 20% LEL) 300°F

Quantity	Item & Description		Estimated Cost
1	15000 SCFM Fume Incinerator Nozzel Mix Burner For #2 Oil With Case III Heat Exchanger For Secondary Heat Recovery To Process Ovens. Including Unit Mounted Controls, Piping & Stub (10') Stack Unit To Be Completly Shop Insulated		120,000 —
	Auxiliary Equiptment		11,400 —
	Excavation & Foundations Piping & Duct Work Insulation Electrical Painting	Installation Costs	48 000 —
	Interest On Investment During Construction (Three Months @ 7½ % Prime Rate)		3365 —
	Total Capital Cost		182,765 —

CONSTRUCTION COST ESTIMATE

DESCRIPTION -- CASE III FUME INCINERATOR WITH HEAT RECOVERY & SECONDARY RECOVERY

UNIT SIZE 15,000 SCFM (20 TO 25% LEL)

PROCESS TEMP = 300°F

QUANTITY	ITEM & DESCRIPTION		ESTIMATED COST
1	15000 SCFM FUME INCINERATOR NOZZEL MIX BURNER FOR #2 OIL WITH CASE III HEAT EXCHANGER FOR SECONDARY HEAT RECOVERY TO PROCESS OVEN. INCLUDING UNIT MOUNTED CONTROLS, PIPING & STUB (10') STACK UNIT TO BE COMPLETLY SHOP INSULATED		127,500 —
	AUXILARY EQUIPTMENT		11,400 —
	EXCAVATION & FOUNDATIONS PIPING & DUCT WORK INSULATION ELECTRICAL PAINTING	INSTALLATION COSTS	48 000 —
	INTEREST ON INVESTMENT DURING CONSTRUCTION (THREE MONTHS @ 7½% PRIME RATE)		3365 —
	TOTAL CAPITAL COST		190,265 —

Construction Cost Estimate

Description — Case III Fume Incinerator
With Heat Recovery & Secondary Recovery
Unit Size 30,000 SCFM (0 To 25% LEL) 70°
Process Temp = 70°F To 300°F (0 To 20% LEL) 300°

Quantity	Item & Description		Estimated Cost
1	30,000 SCFM Fume Incinerator Nozzel Mix Burner For #2 Oil With Case III Heat Exchanger For Secondary Heat Recovery To Process Ougn. Including Unit Mounted Controls, Piping & Stub (10') Stack Unit To Be Completly Shop Insulated		153,000 —
	Auxilary Equiptment		13,200 —
	Excavation & Foundations Piping & Duct Work Insulation Electrical Painting	Installation Costs	60,000 —
	Interest On Investment During Construction (Three Months @ 7½% Prime Rate)		4240 —
	Total Capital Cost		230,440 —

Construction Cost Estimate

DESCRIPTION — Case III Fume Incinerator
With Heat Recovery & Secondary Recovery
Unit Size 30,000 SCFM (20 To 25% LEL)
Process Temp = 300°F

Quantity	Item & Description		Estimated Cost
1	30,000 SCFM Fume Incinerator Nozzel Mix Burner For #2 Oil With Case III Heat Exchanger For Secondary Heat Recovery To Process Ovgn. Including Unit Mounted Controls, Piping & Stub (10') Stack Unit To Be Completly Shop Insulated		161,500 —
	Auxilary Equiptment		13,200 —
	Excavation & Foundations Piping & Duct Work Insulation Electrical Painting	Installation Costs	60,000 —
	Interest On Investment During Construction (Three Months @ 7½% Prime Rate)		4240 —
	Total Capital Cost		238,940 —

CONSTRUCTION COST ESTIMATE

DESCRIPTION — CASE III FUME INCINERATOR WITH PRIMARY & SECONDARY HEAT RECOVERY & CATALYST

UNIT SIZE 5,000 SCFM (0 TO 6 % LEL)

PROCESS TEMP = 70°F TO 300°F

QUANTITY	ITEM & DESCRIPTION		ESTIMATED COST
1	5000 SCFM FUME INCINERATOR NOZZEL MIX BURNER FOR # 2 OIL WITH CASE III HEAT EXCHANGER FOR SECONDARY HEAT RECOVERY TO PROCESS OVEN AND CATALYST BED INCLUDING UNIT MOUNTED CONTROLS, PIPING & STUB (10') STACK UNIT TO BE COMPLETELY SHOP INSULATED		68,100 —
	AUXILARY EQUIPMENT		
	EXCAVATION & FOUNDATIONS PIPING & DUCT WORK INSULATION ELECTRICAL PAINTING	INSTALLATION COSTS	40,000 —
	INTEREST ON INVESTMENT DURING CONSTRUCTION (THREE MONTHS @ 7½ % PRIME RATE)		2,030 —
	TOTAL CAPITAL COST		110,130 —

CONSTRUCTION COST ESTIMATE

DESCRIPTION -- CASE III FUME INCINERATOR WITH PRIMARY & SECONDARY HEAT RECOVERY & CATALYST

UNIT SIZE 5000 SCFM (6 TO 25 % LEL)

PROCESS TEMP = 70°F TO 300°F

QUANTITY	ITEM & DESCRIPTION		ESTIMATED COST
1	5000 SCFM FUME INCINERATOR NOZZEL MIX BURNER FOR # 2 OIL WITH CASE III HEAT EXCHANGER FOR SECONDARY HEAT RECOVERY TO PROCESS OVEN AND CATALYST BED INCLUDING UNIT MOUNTED CONTROLS, PIPING & STUB (10') STACK UNIT TO BE COMPLETELY SHOP INSULATED		98,100 —
	AUXILARY EQUIPMENT		—
	EXCAVATION & FOUNDATIONS PIPING & DUCT WORK INSULATION ELECTRICAL PAINTING	INSTALLATION COSTS	40,000
	INTEREST ON INVESTMENT DURING CONSTRUCTION (THREE MONTHS @ 7½ % PRIME RATE)		2590
	TOTAL CAPITAL COST		140690 —

CONSTRUCTION COST ESTIMATE

DESCRIPTION — CASE III FUME INCINERATOR WITH PRIMARY & SECONDARY HEAT RECOVERY & CATALYST

UNIT SIZE 15,000 SCFM (0 TO 6% LEL)

PROCESS TEMP = 70°F TO 300°F

QUANTITY	ITEM & DESCRIPTION		ESTIMATED COST
1	15,000 SCFM FUME INCINERATOR NOZZEL MIX BURNER FOR # 2 OIL WITH CASE III HEAT EXCHANGER FOR SECONDARY HEAT RECOVERY TO PROCESS OVEN AND CATALYST BED INCLUDING UNIT MOUNTED CONTROLS, PIPING & STUB (10') STACK UNIT TO BE COMPLETELY SHOP INSULATED		136,050 —
	AUXILARY EQUIPTMENT		—
	EXCAVATION & FOUNDATIONS	INSTALLATION COSTS	48,000 —
	PIPING & DUCT WORK		
	INSULATION		
	ELECTRICAL		
	PAINTING		
	INTEREST ON INVESTMENT DURING CONSTRUCTION (THREE MONTHS @ 7½ % PRIME RATE)		3,450 —
	TOTAL CAPITAL COST		187,500 —

CONSTRUCTION COST ESTIMATE

DESCRIPTION — CASE III FUME INCINERATOR WITH PRIMARY & SECONDARY HEAT RECOVERY & CATALYST

UNIT SIZE 15,000 SCFM (6 TO 25% LEL)

PROCESS TEMP = 70°F TO 300°F

QUANTITY	ITEM & DESCRIPTION	ESTIMATED COST
1	15,000 SCFM FUME INCINERATOR NOZZEL MIX BURNER FOR # 2 OIL WITH CASE III HEAT EXCHANGER FOR SECONDARY HEAT RECOVERY TO PROCESS OVEN AND CATALYST BED INCLUDING UNIT MOUNTED CONTROLS, PIPING & STUB (10') STACK UNIT TO BE COMPLETELY SHOP INSULATED	169,500 —
	AUXILARY EQUIPMENT	—
	EXCAVATION & FOUNDATIONS PIPING & DUCT WORK INSULATION ELECTRICAL PAINTING } INSTALLATION COSTS	48,000
	INTEREST ON INVESTMENT DURING CONSTRUCTION (THREE MONTHS @ 7½% PRIME RATE)	4,080 —
	TOTAL CAPITAL COST	221,580 —

CONSTRUCTION COST ESTIMATE

DESCRIPTION — CASE III FUME INCINERATOR WITH PRIMARY & SECONDARY HEAT RECOVERY & CATALYST

UNIT SIZE 30,000 SCFM (0 TO 6% LEL)

PROCESS TEMP = 70°F TO 300°F

QUANTITY	ITEM & DESCRIPTION		ESTIMATED COST
1	30,000 SCFM FUME INCINERATOR NOZZEL MIX BURNER FOR # 2 OIL WITH CASE III HEAT EXCHANGER FOR SECONDARY HEAT RECOVERY TO PROCESS OVEN AND CATALYST BED INCLUDING UNIT MOUNTED CONTROLS, PIPING & STUB (10') STACK UNIT TO BE COMPLETELY SHOP INSULATED		218,875 —
	AUXILARY EQUIPMENT		—
	EXCAVATION & FOUNDATIONS PIPING & DUCT WORK INSULATION ELECTRICAL PAINTING	INSTALLATION COSTS	60,000
	INTEREST ON INVESTMENT DURING CONSTRUCTION (THREE MONTHS @ 7½ % PRIME RATE)		5230
	TOTAL CAPITAL COST		284105

CONSTRUCTION COST ESTIMATE

DESCRIPTION — CASE III FUME INCINERATOR WITH PRIMARY & SECONDARY HEAT RECOVERY & CATALYST

UNIT SIZE 30,000 SCFM (6 TO 25% LEL)

PROCESS TEMP = 70°F TO 300°F

QUANTITY	ITEM & DESCRIPTION		ESTIMATED COST
1	30,000 SCFM FUME INCINERATOR NOZZEL MIX BURNER FOR # 2 OIL WITH CASE III HEAT EXCHANGER FOR SECONDARY HEAT RECOVERY TO PROCESS OVEN AND CATALYST BED INCLUDING UNIT MOUNTED CONTROLS, PIPING & STUB (10') STACK UNIT TO BE COMPLETELY SHOP INSULATED		257,100
	AUXILARY EQUIPTMENT		—
	EXCAVATION & FOUNDATIONS PIPING & DUCT WORK INSULATION ELECTRICAL PAINTING	INSTALLATION COSTS	60,000 —
	INTEREST ON INVESTMENT DURING CONSTRUCTION (THREE MONTHS @ 7½% PRIME RATE)		5945 —
	TOTAL CAPITAL COST		323,045 —

Reproduced from best available copy.

Reproduced from best available copy.

CONSTRUCTION COST ESTIMATE

DESCRIPTION: CASE 4 FUME INCINERATOR

PRIMARY HEAT RECOVERY - NO CATALYST

UNIT SIZE 6000 SCFM 7 to 21% LEL

PROCESS TEMPERATURE = 300°F

QUANTITY	ITEM & DESCRIPTION	EST. COST
1	6000 SCFM Fume Incinerator Skid mounted, In-Line Burner for Natural Gas Fuel Including Unit Mounted Controls, Piping, Stub (10') Stack, and Primary Heat Exchanger of 35% Efficiency. Unit to be completely Shop Insulated	60,500
	Auxiliary Equipment - Fan & Motor	3,600
	Excavation & Foundations Piping & Ductwork Insulation Electrical Painting	85,000
	Interest on Investment During Construction (Three Months @ 7-1/2% Prime Rate)	2,800
	TOTAL CAPITAL COST	$151,900